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CATALOGUE OF THE LOAN EXHIBITION OF PROCESS ENGRAVING.

HELD AT THE VICTORIA AND ALBERT MUSEUM, SOUTH KENSINGTON,

1905.

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INTRODUCTION.

The Exhibition of British Engraving and Etching, held in 1903, was originally intended to comprise all methods of *intaglio* engraving, including mechanical processes. This scheme, however, was considered by the Advisory Committee to cover too large a field to be properly shown in one Exhibition; accordingly that Exhibition was restricted to Fine Art Engraving and Etching, produced in England, and Process Engraving was reserved for a future occasion. Thus the present Exhibition is devoted to examples of Photogravure, Photo-lithography, and kindred processes of reproduction by means of photography, including half-tone colour printing.

Firms of foreign countries have been invited to contribute in order that the progress abroad of these processes may be compared with that in this country.

An historic section has been arranged showing the early development of the processes.

The present time seems very appropriate for an exhibition of the kind, on account of the high degree of perfection these photo-mechanical methods of reproduction have now attained after many years' slow development, and more so in view of their steadily increasing importance as regards their pictorial, scientific, educational and industrial aspects and applications—their accuracy of delineation, comparative cheapness of production, and the facilities they offer for producing copies in large numbers by ordinary methods of printing.

The art of engraving in intaglio as a means of pictorial representation and for inscribing records on stone, wood, metals and plastic materials is as old as man himself, though copper-plate engraving and etching only came into use as an art in the fifteenth century, contemporaneously with the art of type printing, and until the invention of lithography by Senefelder about 1798, a little over a century ago, these with rough wood engravings were the only methods of illustration or graphic reproduction. The simplicity and comparative cheapness of lithography, and its special power of reproducing the actual hand work of the artist soon brought it into popular use. It was, however, scarcely out of its cradle, when a new art, born of light and sunshine, came into being, and though of slow growth, this has gradually waxed in strength and outstripped its older sister arts in usefulness and widespread popularity. It is noteworthy that the first practical outcome of the new art was a process of heliographic engraving, which has in its time produced some fine results, and is still in use in a modified form.

Although Thomas Wedgwood was the first to use the camera obscura for photography, he and Davy failed to fix the pictures they obtained on paper treated with salts of silver, and it was left to Joseph Nicéphore Niépce, of Châlon-sur-Saône, to produce the first permanent photograph in the camera and at the same time the first photo-engraving. We know but little of Niépce's early work from very fragmentary correspondence between him and his brother Claude. In 1813 he took up lithography, but having difficulty in procuring suitable stone he used polished tin plates, and experimented with

various varnishes. In 1816 he seems to have turned his attention to photography, and there is little doubt that he began by following in the footsteps of Wedgwood and Davy, fitting up rough cameras with lenses, and experimenting with silver chloride, producing small negative images of outside objects on prepared paper which darkened in the exposed parts, but could not be fixed. In 1817, he tried gum guaiacum, a resin which is very sensitive to light, with the idea that after exposure it would become less soluble in alcohol. In this he was disappointed, but no doubt he was thus led to seek for a more suitable substance among the resins known to be sensitive to light, especially bitumen which was in common use by painters and engravers and becomes quite insoluble in its ordinary solvents after sufficient exposure to sunshine.

He coated his tin plates with a varnish of bitumen dissolved in oil of lavender or oil of dippel, and when dry placed them under engravings and exposed them to light, afterwards developing the image with a mixture of the oils of lavender and white petroleum, thus obtaining plates which showed the design in bare metal on a varnish ground, so that it could be etched and yield impressions in the copper plate press. One well known early specimen of this work is the portrait of Cardinal Amboise done in 1824. (A proof of this plate is in the Exhibition, also one showing traces of a view.) He also applied this process to pictures from nature in the camera, with some success, considering the insensitiveness of the bitumen surface. The varnish was very thin, and so there was, as Niépce complains, a want of depth and drawing, but this he tried to remedy by fuming the plates with sulphur or iodine. Latterly he used plates of copper faced with silver, also fuming with iodine, and this combination, no doubt, contained the germ of Daguerreotype which Daguerre perfected after his partnership with Niépce in 1827. In that year Niépce presented a paper to the Royal Society of London through Mr. Bauer, accompanied by specimens of his plates and prints, but as he was unwilling to disclose the details of his method, until it was perfected, the paper could not be received. He died in 1833, having carried on his experiments unremittingly for twenty years, and although they were not crowned with the success they so well deserved, they incontestably secured a place for the new art of sun-printing among the graphic arts, and laid the foundation of modern photo-mechanical printing, if not of photography generally. He was undoubtedly the first to succeed in fixing the images produced in the camera obscura, to engrave them on metal and to print off copies. For this reason it seems desirable to notice his work at some length.

Niépce's process was continued and perfected by his nephew M. Niépce de St. Victor, as described in his "*Traité pratique de Gravure Héliographique sur Acier et sur Verre*," Paris, 1856. Until the introduction of the improved modern collochromate methods of photographic engraving, the bitumen process, much as it was left by Niépce, was used to a considerable extent for photo-engraving and photo-lithography in line and half-tone, relief and intaglio, especially in France and Austria. Some of Niépce's early work and other specimens of the bitumen process are in the collection.

As soon as Daguerre had perfected the beautiful process bearing his name, many efforts were made by Donné, Fizeau, Berres, Groves and others, to etch the delicate images produced on the silvered copper plates and so transform them into engraved plates from which copies could be printed off in the press, but they were unsuccessful from the

difficulty of etching such delicate images to a sufficient depth and the softness of the silver which prevented more than a very few copies being printed off.

Almost contemporaneously with the Daguerreotype and Fox Talbot's invention of the photographic negative process known as calotype and an improved method of silver printing, Mungo Ponton, in 1839, brought to notice a simple method of photographic printing on paper soaked in a solution of bichromate of potash and dried, the yellow colour of the paper changing to brown by exposure to light. The prints were fixed by washing in water. This very simple process of bichromate printing has been the source of many valuable practical processes of photo-mechanical printing in line and half-tone suitable for copper plate, lithographic and letter-press printing, and all the most modern methods in which gelatine, gum, or starch are used in combination with alkaline bichromates are founded upon it.

This combination of organic colloids with the alkaline bichromates, under the influence of light has many valuable properties for the process worker:—

(1.) The parts exposed to light are rendered insoluble, in hot or cold water, the unexposed remaining soluble.

(2.) A film of gelatine and bichromate of potash supported on a steel or copper plate and exposed to light under a photographic cliché negative or positive, will become impermeable to solutions of perchloride of iron and certain other metallic salts, in proportion to the action of light, the underlying metal plate being etched more or less deeply in the inverse proportion. This property forms the basis of Fox Talbot's processes of photoglyphy (1852 and 1858) and of modern photogravure on Karl Klic's principle (1879).

(3.) A similar film exposed in the same way will become unabsorbent of water in proportion to the action of light, and if placed in cold water will swell up unevenly and form a relief or mould from which casts can be made in plaster, etc., or by electrotyping. By suitable manipulation the gelatine surface can be wrinkled to form a discriminating grain, stronger in the thicker parts than in the thinner. This forms the basis of Pretsch's (1854) and later photo-galvanographic or photo-electrotype processes of photo-engraving.

(4.) A similar film exposed to light under a negative, then moistened with water like a lithographic stone, and inked with a roller and printing ink, will only take up the ink in the exposed parts in proportion as the action of light has rendered the film unabsorbent of water. If the exposed film be inked up without wetting and then placed in warm water, all the unexposed gelatine will dissolve, leaving ink only on the image, which may then be printed from direct or by transfer to stone, etc. The first method is the basis of Poitevin's process of direct photolithography (1855) and of Tessié du Mothay's process of photocollotype (1865), the second of photolithography by transfer (Asser—1855), and for this gum, albumen or starch may replace gelatine.

Having thus briefly noticed the origin and main principles of the photo-mechanical processes, some of the more important may be described, though it will be impossible to give more than an outline of them.

Photographic Engraving in Intaglio.

Under this head are included the methods by which a metal plate engraved in line or half-tone suitably for printing in the copper plate press, may be obtained by the aid of photographic processes. They are cheaper and quicker than hand-engraving and have the same advantages, viz., that the photo-engraved plate when steel-faced, will yield a large number of equally good copies with little or no wear; it may also be electrotyped if desired for duplication, and transfers may be made to stone, zinc or aluminium, for rapid machine printing.

There are two principal methods by which an engraved plate may be obtained by means of photography:—(1.) By producing a negative photograph upon a metal plate coated with bitumen, bichromated gelatine or other suitable resist, and biting or etching the image on the plate with acids or chemical solutions. (2.) By obtaining a positive photographic image in graduated relief upon a suitable surface as a matrix upon which copper can be deposited electrically to form a printing plate.

A very large number of processes of photo-etching and photo-electrotype on the above principles have been worked, but the following are now most largely used and may be considered typical.

Photo-etching Methods.—The simplest and oldest photo-etching method is Niépce's with bitumen already noticed. It is chiefly suitable for line work and typography, but has been almost abandoned in favour of the quicker and more certain collo-chromate methods. A clean, polished copper plate is coated with a solution of bitumen in benzole or turpentine, and exposed to light under a transparent positive, preferably a collodion film transferred from glass on to the plate so as to ensure perfect contact. After sufficient exposure, the plate is treated with olive oil and turpentine, which dissolves the soluble bitumen in the lines of the picture, leaving the ground protected by the insoluble bitumen. The plate can then be etched with the usual acid solutions used by engravers. It is preferable, however, in order to obtain the finest results in line, to develop a positive image in relief on the plate, from a negative, and obtain a matrix in relief which can be electrotyped. Specimens of this method produced at the Royal Printing Office in Berlin, before 1868, are in the collection, also copies of bitumen engravings by Amand Durand and others about the same date.

Fox Talbot's photoglyphic processes were also on this principle, but instead of bitumen he used a mixture of gelatine and bichromate of potash spread over a steel or copper plate. After exposure to light under a transparency, so as to produce a negative image on the plate, washing and drying, a resinous aquatinta grain was laid over the surface and the image bitten through the gelatine and resin with solutions of perchloride of iron, using first a strong solution and repeating the etching two or three times with weaker solutions. There was always more or less unaltered gelatine in contact with the plate, with risk of the etching solution spreading and biting unevenly, so the process never came into practical use. It was, however, successfully worked to a certain extent by Garnier and other French photo-engravers, who got over the difficulty by repeating the exposures and etchings for the lighter half-tones, the medium tones and the shadows. Several of Fox Talbot's early plates, with prints from them are shown, among them some showing the effect of a crape grain, this method

being the forerunner of the modern half-tone block process. A copy of Garnier's fine plate of the Château de Maintenon, which gained the gold medal at the Paris Exhibition in 1867, is also shown.

In 1879, Karl Klic, of Vienna, made some very important modifications of this process, simplifying and rendering it thoroughly practical, so that it has now superseded all other methods of photo-sculpture in half tone. A clean, well-polished copper plate is covered evenly in a dusting box with a grain of very finely powdered bitumen or resin, which is fixed on the plate by gently heating it. This grain serves to hold the gelatine image firmly to the plate and to prevent spreading and uneven action of the etching solution. Instead of impressing the photographic image directly on the plate, Klic printed it from a *reversed transparency* on to the gelatinous tissue used in ordinary pigment printing (Swan's process). The exposed tissue is transferred to the grained copper plate under water, and, after a short interval, developed in warm water, as in ordinary pigment printing, leaving a skin of insoluble gelatine, showing the lights and shadows of the picture reversed and in more or less relief, the lightest parts being darkest and thickest, the intermediate tones lighter and thinner, and the darkest shadows nearly bare copper. The margins and back of the plate being varnished, it is etched with a strong solution of perchloride of iron, which at once attacks the copper in the bare parts, and at the same time hardens the gelatine, though gradually permeating it and attacking the copper beneath to varying depths corresponding to the thinness of the gelatine film. The deepest shadows of the picture which are nearly bare are strongly bitten, the intermediate shades less and less as they become lighter, and the highest lights under the thickest gelatine should be bright copper. For line work one etching is usually sufficient and some operators prefer to use a single solution throughout for half-tone work, but it is better to first etch the deep shadows with a strong solution and then use a series of three or four diluted solutions, which will more readily penetrate the thicker layers of gelatine. In any case, the etching is only a matter of minutes, and after the removal of the gelatine and varnish and cleaning of the surface the plate is ready.

The method of transferring and developing the gelatinous image upon the plate was Klic's great improvement because it effected the removal of all useless gelatine not required to form the image, which was left firmly fixed to the plate by the grain, so that the etching fluid could act directly on the copper through the resinous grain in exact proportion to the overlying thicknesses of gelatine.

The great advantages of this method are its rapidity and comparative cheapness. The whole operation of producing a plate which might take months to engrave by hand, can be completed in a few hours at a very small cost. With suitable subjects great richness of tone and effect can be produced, and the most delicate gradations of shade brought out with marvellous perfection. It is very valuable for all kinds of delicate half-tone work, and the reproduction of paintings. The plates lend themselves most perfectly to retouching or working up to enhance the artistic effect, but with good originals this is almost unnecessary. The drawback to it is the comparative costliness of copper-plate printing, but this may also be reduced by mechanical methods, such as that known as the Rembrandt. The process is largely represented in the collection by contributions from the Ordnance

Survey of Great Britain, the Survey of India, the Reichsdruckerei, Berlin, the K.K. Hof- und Staatsdruckerei, Vienna, and many private firms in this country and abroad.

The successive stages of the process will be understood from the exhibit of the Swan Electric Engraving Company (169), also from that of the L.C.C. School of Photo-engraving and Lithography (250). The series of plates illustrating "Meisengravure" (127) is interesting as showing the preparation of an etched photogravure plate from an ordinary cross-lined screen negative, such as is used for half-tone process blocks, and by the same methods, but using a transparency and not a negative.

Photo-electrotype Methods.

The object of these methods is to produce a matrix in gelatine from which an intaglio plate suitable for printing in the copper plate press, may be obtained by electrotyping. Before the general adoption of Klic's process several more or less efficient methods of photo-galvanography or photo-electrotype were in use, one of the best being that adopted by Messrs. Goupil, of Paris, and their successors for the beautiful plates published by them. The process, however, was a secret one, as were most of the others, and the fine effects produced were largely due to skilful retouching. A method of the kind was worked very successfully in this country by Messrs. A. & W. Dawson (The Typographic Etching Company).

There are four methods by which these collochromate reliefs may be obtained.

(1) The swelling method of Pretsch, and

(2) The dissolving out method of Poitevin already noticed.

(3) Placet's method of supporting the collochromate film on a thin transparent sheet of mica, exposing from the back through the mica and then washing away the unaltered gelatine from the front.

(4) Swan's method of printing the photographic image upon carbon tissue, transferring it to a glass or metal plate and developing a picture in relief with warm water, hardening, drying, rendering it conductive and electrotyping.

The early dissolving and swelling methods were very imperfect. An endeavour was made to work Pretsch's process commercially in England, but although some good plates were made, it failed. In 1864, Mr. Duncan Dallas who had been associated with Pretsch, brought out an improved process of photo-electric engraving, but the details were not published. Specimens of Pretsch's process and one of Dallas' are shown.

Placet, of Paris, seems to have been the first to recognise, in 1862, the necessity of exposing the collochromate film from the under side through a transparent support, so as to be able to wash away the unaltered gelatine from the unexposed side and thus obtain a relief matrix in hardened and insoluble gelatine, which could be metallised and electrotyped at once. He also treated his half-tone reliefs with chemical solutions to produce a grain on them. His plates were very good and some prints are in the collection.

Drivet, of Paris, seems to have worked a similar process, but produced his grain by impressing a cross-ruling or tint on the negative and so breaking up the image. This grain is rather mechanical as will be seen from the specimens shown.

In 1865 (Sir) J. W. Swan, who invented the carbon printing process, patented a method of photo-engraving in which he impressed the photographic image on to a coloured chromo-gelatine tissue from a negative bearing a ruled grain, transferred this tissue face downwards on a glass or other suitable support, and developed it in warm water from the back, dissolving all the unaltered gelatine and leaving a positive image in relief, corresponding to the lights and shades of the picture. After hardening with alum or iron solutions, it was dried, rendered conductive and electrotyped. This method was an enormous improvement, and made the process quite practical. In 1868, Mariot used a similar method for copying maps in the I. R. Military Geographical Institute in Vienna, where it was used for many years for line and half-tone work. Another method was worked out by Colonel Avet of the Italian Army, for use in the Military Topographical Institute at Florence. A variation was fully described in Messrs. Geymet & Alker's treatise, "*Gravure héliographique, Galvanoplastie*," Brussels, 1870. They say that an amateur, M. Audra, was the first to demonstrate it. The writer, working from their indications, was able to work the method successfully in Calcutta, using ordinary autotype pigmented tissue, which was found to give a peculiar graduated grain after treatment with tannin, which was all that could be desired. This method, however, proving uncertain, he was led to experiment and found, in 1881, a satisfactory method of obtaining a suitable grain by powdering the wet reliefs with fine sand, glass or emery powder, which had been previously well washed and treated with stearine or wax to prevent its adhesion to the gelatine. As these powders sank into different depths in the moist gelatine surface, according to the thickness of the gelatine, they produced a graduated grain coarser in the shadows than in the lights. The method gave fairly good results for half-tone work and specimens are shown. It was worked successfully in Calcutta till 1884, when it was superseded by a photo-etching process on Klic's principle, which was found much quicker and more certain. A plate might take three weeks to electrotype and fail, whereas a failure with a photo-etched plate could be remedied immediately, and in any case, the long delay was saved. The electrotyped plates required more retouching. Specimens of this waxed-sand method are exhibited (27), also of Mariot's (25).

One point in which the processes of photo-engraving have a great advantage over ordinary photo-lithography or line blocks, especially in copying fine line work on drawings, is their power of reproducing the faintest lines in their true value, and unbroken.

Before printing from photo-engraved plates, whether etched or electrotyped, the surface of the plate must be protected by a deposit of iron (aciérage) in order to harden it and permit of an extended number of prints being pulled. This steel-facing can be easily removed and renewed.

Woodbury-Type.

Before the invention of photo-collotype and at a time when photo-lithography, and photo-engraving were still very imperfect and incapable of giving a good rendering of half-tone, Mr. Walter Woodbury, in 1864, solved the problem in a very ingenious manner and by a mode of operation analogous to "Nature Printing" was able to produce permanent prints with perfect photographic gradation, combined with all the exquisitely transparent delicacy and richness of tone that characterise the best silver prints. The process, though so

beautiful, had several defects which prevented its general use especially for work of any size or containing pure white spaces. The prints also had to be mounted. Consequently it has been practically superseded by photo-collotype, heliogravure and half-tone process blocks.

The *modus operandi* was briefly as follows :—A glass plate was coated with a tough film of collodion and then with a thick layer of bichromated gelatine and dried. The thick tissue so formed was stripped from the glass and exposed to direct light with the collodion side next to the photographic negative. It was then temporarily attached to a glass plate and developed in warm water, like a carbon print, to dissolve all the unaltered soluble gelatine, leaving an image in relief, the highest parts of which represented the deepest shadows of the picture, and the intervening parts the gradations up to the highest lights. When dry this raised image would be quite hard and capable of being pressed into soft metal without suffering injury itself.

The tissue bearing the image having been stripped from the temporary support, was laid face downwards on a block of lead or type metal, one-third of an inch thick, between two finely surfaced steel plates and pressed in a powerful hydraulic press. The prominent parts of the relief were thus forced into the soft metal, and produced a mould corresponding to the lights and shades of the picture. The inside surface of the mould being perfectly smooth and grainless, and the metal very soft, any method like copper-plate printing would be impossible, Woodbury, therefore, used a transparent ink consisting of gelatine coloured with any suitable pigment. The mould being slightly greased and placed in a special press, a little of the warm coloured gelatine was poured into the middle of it, a piece of special hard-surfaced paper laid above it and pressed strongly down to force the ink into all the depressions of the plate, and squeeze out the ink between the surface of the metal and the paper in the high lights of the picture. The gelatine was allowed to set and attach itself to the paper, which was then removed bearing a perfect impression of the picture in coloured gelatine, corresponding in intensity and gradation of shade to the depths in different parts of the lead mould. After fixing in a solution of alum the prints were dried, trimmed, and mounted.

Mr. Woodbury afterwards brought out a modification of the process, called *Stannotype*, in which gelatine moulds coated with tinfoil were substituted for the leaden moulds, but it never came into general use. Specimens of both methods are shown.

Woodbury also applied his process to photo-engraving, by incorporating a gritty powder in the gelatine tissue, so that a grained surface was given to the relief print which was then electrotyped to form the printing plates. The method gave very good results.

Photo-Lithography.

One of the simplest and most generally useful photo-mechanical processes is photo-lithography, or the analogous methods in which plates of zinc or aluminium replace the cumbrous and costly lithographic stone. As in the case of lithography, the use of these processes for book illustration and small work has been to some extent abandoned in favour of "process" blocks, but for reproducing plans, maps, and large drawings in black and colour they are still valuable.

In ordinary lithography the design may be drawn directly on the stone or transferred to it from a drawing on paper. In photo-lithography, also, the surface of the stone or plate may be sensitised and the photographic image impressed directly, or it may be transferred from a photographic print in greasy ink on paper. These two systems are practically represented by the asphaltum methods for direct work on the stone, and the collochromate methods for transfer work. The latter have now generally superseded the former in both systems.

The earliest asphaltum process recorded was published, in 1852, by Barreswill, Lemercier, Lerebours and Davanne; some specimens of it are in the collection. The photographic image was obtained on the stone much in the same way as in Niépce's original photo-engraving process, a reversed photographic negative being used. The bitumen was dissolved in ether. The method is more especially suited to line work, but some very fair work in half tone has been done by careful graining of the image on a rough stone or by repeating the exposures for the light, medium, and dark half-tones. Specimens of the first method by Reiffenstein and Roesch, of Vienna (55), and of the second by Marie, of Paris (42), are shown.

Improved methods of photo-zincography have been introduced, depending on the use of bitumen or a soluble collochromate-film with a positive photographic cliché or a drawing on tracing paper, so as to form a negative image in bitumen or hardened collochromate, with clear lines which are etched with acid and inked in, the ground is then removed with appropriate solvents, benzole in the one case, dilute acid in the other, the plate gummed and made ready for printing. These methods are economical because no photographic negative is required. By special treatment bitumen can be rendered fairly sensitive to light, but far less so than the collochromate mixtures and it is not so convenient, though it is capable of producing very fine work.

The first direct collochromate method of photo-lithography recorded was used in 1840 by Joseph Dixon of Massachusetts, who copied bank notes upon stone coated with gum and bichromate. It was not published till 1854. Poitevin's direct photo-lithographic process, of 1855, led to a long series of these methods and to modern photocollotype. He coated his stone with a mixture of albumen and bichromate, exposed it to light under a reversed negative, washed to remove the bichromate and inked-in the image while damp with a lithographic roller, the ink being deposited on the altered and unabsorbent parts containing the oxide of chromium, while the moistened parts refused it in proportion to the extent of the action of light upon them.

Though some very successful results were thus obtained the process was a delicate one, and it was soon realised that it was better to have the image in fatty ink in direct contact with the stone by transfer, and Asser, of Amsterdam, was the first to work the method in 1859. He coated unsized paper with starch, sensitised it on a strong solution of bichromate of potash; when dry it was exposed to light under a negative, the print heated with a flat iron, then moistened and rolled in with lithographic transfer ink, and the image so obtained was transferred to stone. A very little later Colonel Scott, R.E., worked out, under Sir Henry James, the method of photozincography which has been used at the Ordnance Survey Office, Southampton, with great success for copying maps, plans, ancient records, etc., and also very largely in

India for similar work. Curiously enough, while these experiments on zinc were being made in England in 1859, Mr. W. Osborne, of the Surveyor General's Office, Melbourne, was working out a similar method on stone which has been largely used in the Australian Colonies. A transfer print and a small photo-lithographic map by him are in the historical collection, as well as early specimens of the Southampton method. The Ordnance Survey Office, Southampton, has also contributed a large collection of negatives, copper-plates and proofs illustrating the modern methods of map printing.

In the Southampton process, paper is coated with a mixture of gelatine and bichromate of potash, dried and exposed to light under a dense negative. It is then coated evenly with lithographic transfer ink in a press, washed in warm water to remove all the unaltered gelatine and bichromate together with the superfluous ink in the unexposed parts forming the ground of the drawing, leaving this white, while the ink remains attached to the lines, forming a photo-transfer print. Before transfer to zinc, the print is slightly damped and laid face downwards on a clean grained zinc plate in a lithographic press, and passed through under heavy pressure. The paper is then wetted and stripped off, leaving the ink firmly attached to the plate, which is then etched with a solution of gum, nutgalls, and phosphoric acid, and proved in the ordinary way. In other similar processes starch, albumen, or gum have been used instead of gelatine, also stone, or aluminium in place of zinc, but the general principle is the same. The most notable modification of the process is Simonau and Toovey's, of Brussels, who coated paper with gum arabic and bichromate, exposed under a negative, then placed the print face downwards on a stone in a vertical press with several sheets of wet blotting paper above it, pressure being applied, the gummy coating of the paper sank into the stone in the soluble parts, while under the insoluble parts the stone was left bare and ready to take up printing ink applied with a roller. Some very fair work in half-tone was done by this process, and specimens are shown.

The transfer processes have one great advantage, that in reproducing large maps or drawings, the negatives may be taken in sections and the transfer prints joined up. The direct processes are limited to the size of a single negative.

Several methods of photo-lithography in half-tone have been introduced from time to time, by washing out and inking up methods, direct and by transfer, but few of them compare well with a good lithographic chalk drawing, owing to the difficulty of obtaining an open grain and preventing the gradual blocking up of the image in the shadows. One of the best is Husband's process of "Papyrotint" in which a grain or reticulation is given to the surface of the gelatinous coating of the photo-transfer paper, the image being rolled in on the paper. Sprague's ink photo process is on the same principle.

Transfers or direct impressions from half-tone cross-line screen or "grain" negatives, as well as transfers from collotype or heliogravure plates, are also in use for photo-lithographic printing on stone, zinc, or aluminium.

Photo-collotype, or Photo-type.

In this process, as the name implies, the printing surface is a moist film of gelatine usually supported on glass, the principle being the same

as in Poitevin's inking up process of photo-lithography already noticed, but differing in the distinct recognition of the colloid film as the printing surface.

In 1866, MM. Tessié du Mothay and Maréchal of Metz, discovered that the stone or metal plate, hitherto used as a printing surface, might be replaced by a mixture of isinglass, gelatine and gum, treated with an acid chromate and evenly spread upon a well polished metal plate, because if, after exposure to light under a photographic negative, such a gelatinous surface were moistened with water, printing ink applied with a roller would adhere to the parts acted on by light in proportion to the intensity of the gradations of light and shade produced on them by the action of light and their consequent impermeability to water. Photographic prints in fatty ink reproducing the most delicate gradations of shade without apparent grain, or break of continuity could thus be produced. These phototype plates were printed in a lithographic press, two inks being used, a stiff one for the shadows, followed by a thinner one to bring out the delicate half-tones. They did not yield many impressions, but in 1869, Albert of Munich, improved the method generally by substituting a thick glass plate for the metal plates used by Tessié du Mothay for supporting the film. He was thus able to give the rough ground surface of the glass a preliminary coating of an albuminous substratum over which the sensitive mixture of gelatine and bichromate was applied, and after the dry film had been exposed to light under a reversed photographic negative, the back of the film was sunned in order to harden the under surfaces of the compound coating and prevent uneven swelling from the presence of an underlying layer of partly unexposed gelatine. Further improvements were made by the introduction of hardening agents, such as chrome alum and resinous gums into the film, and this method is still current.

In 1870, Mr. Ernest Edwards introduced a very important modification called "Heliotype." He formed a gelatinous skin with gelatine, bichromate of potash and chrome alum spread on a waxed glass plate and stripped from it when dry. The glazed side was then exposed under a reversed negative, as usual, and the back of the film hardened as in Albert's method. After this it was attached under water to a pewter plate coated with india rubber cement and pressed into perfect contact with it. The bichromate salt was then removed, and, after soaking, the plate was ready to be printed from in an ordinary Albion press. This method of printing with vertical pressure has been found most suitable, even with glass plates, but the lithographic press is also used, and by the use of thin metal plates to support the films they can be printed in large numbers in machine presses. The plates of course have to be kept constantly damp while printing.

A great many methods of collotype have been proposed, but the general principle in all is the same. The process is somewhat delicate and difficult to work, but it is valuable as a cheap and practical method of photo-mechanical printing in half-tone, and indeed some of the best prints of the kind are hard to distinguish from silver prints. It is being largely used for post-cards and commercial work. Specimens of some of the earlier methods by Tessié du Mothay, Edwards, Carlos Relvas, and many modern workers are shown, especially in their application to colour-printing. The different stages of the process are illustrated in the exhibit (262) from the L.C.C. School of Photo-engraving.

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Photographic Colour-Printing.

One of the most important modern applications of photography is in the representation of coloured objects by methods of three-colour printing. It is based upon what is known as the Young-Helmholtz theory of colour vision, which supposes three distinct primary colour sensations —red, green, and blue-violet—in the solar spectrum, all others being due to mixtures of these, in various proportions, the three together normally forming *white*. A distinction must, however, be made between the colour sensations produced, as above, by mixtures of *lights*, and by mixtures of *pigments*. For instance, blue and yellow lights combined will produce the sensation of white, yellow being a mixture of red plus green, and blue a mixture of blue-violet plus green, &c.; whereas, as is well known, a mixture of blue and yellow pigments appears green, because the red and violet are absorbed and not reflected. The mixture of pigments, complementary to the primary red, green and blue-violet should appear *black*.

This theory was fully investigated by Prof. J. Clerk Maxwell, in 1860, in his paper "On the Theory of Compound Colours, and the Relation of the Colours of the Spectrum" (*Phil. Trans. R.S.* 150, p. 157) and he worked out curves which represented the distribution of these three primary sensations among the different rays of the spectrum, which, being sufficiently near photographic requirements, are still, to some extent, the standard for this class of work. In 1861 Maxwell demonstrated that this indirect method of colour-reproduction by photography was practicable by taking three photographs of a piece of coloured ribbon through three coloured liquid filters, and giving images representing the red, green, and blue parts separately. By again superposing these images in a triple projection lantern through the filters, an image of the coloured ribbon was produced.

In 1865, Henry Collen and Baron Ransonnet suggested printing processes on a similar principle but wrongly based on the Brewster primaries—red, yellow and blue. In 1867 and 1868, Charles Cros and Louis Ducos du Hauron independently worked out and patented photo-trichromatic processes. The work of the latter and his brother Alcide, carried on for many years, covered nearly all the improvements since made, and was very remarkable, considering the disadvantage from which they laboured from the want of suitable colour-sensitive plates. Their colour filters were orange, green and violet, the shades being adjusted to suit their collodion plates which were rendered colour sensitive with eosin, and they pointed out the necessity of the adjustment of the filters to the plates which is now fully recognised. They invented a photo-chromoscope for viewing triple transparent pictures in colour and suggested the method now known as the "Joly process," in which a single screen ruled in alternate lines, red, green and violet took the place of the three single colour filters. Also the printing of coloured pictures by superposition of pigment prints on red, yellow and blue tissues. (*Traité pratique de Photographie des Couleurs.* Paris, 1878.)

The first applications of the method to chromo-photo-collotype printing were made in 1870 by Husnik of Prague, and Joseph Albert of Munich, also by Fritsch of Berlin and Löwy, of Vienna. The three-colour block process does not seem to have come into practical use till about 1885, though work of the kind had been done with four or more blocks, by Goupil of Paris, and Angerer and Göschl of Vienna. Mr.

F. E. Ives is, however, said to have produced the first photo-chrome picture from three letter-press blocks. He has been foremost in investigating the three-colour method scientifically, starting from Maxwell's curves, and has perfected the photo-chromoscope for viewing three colour transparencies. Sir William Abney, Mr. Sanger Shepherd, Baron von Hübl, Professors Eder and Valenta, Messrs. Vidal and Lumiére, and many others, have contributed to the better knowledge of the subject, and trichromatic printing in collotype and block-printing as well as transparent and superposed pigment prints have now become commercial processes more or less successfully worked. This will be seen from the fine collection of specimens from the Reichsdruckerei, Berlin, the K. K. Hof und Staatsdruckerei, Vienna and many other exhibitors, British and foreign.

The problem to be solved in photographic three-colour printing is a complicated one, because the light reflected from the objects to be reproduced must first be analysed and divided into its three components, red, green, and blue-violet, by means of carefully selected coloured screens or filters, so that each of them may impress a negative image, or colour-record, upon three suitably sensitised photographic plates of the parts of the object containing it, the densities of the three images being proportionate to the quantity of each light passing through the screens and its luminosity. These three images must correspond exactly in size, so that they may register correctly.

From these three colour-sensation negatives positive prints are made suitable for the process selected, whether by superposition of transparent films, collotype or block printing, and must be printed in three colours or pigments, complementary to the filters used, viz., cyan-blue for the red sensation negative, crimson for the green, and yellow for the blue-violet. The correct combination of these three prints should reproduce the colours of the original. Owing to the difficulty of obtaining suitable permanent pigments to meet the theoretical requirements in three-colour block printing, some workers add a fourth block printed in grey, or black to give strength and harmonise the colours. The greatest care has to be taken throughout in the proper selection and adjustment of filters, photographic plates and printing colours. The least divergence throws out the balance and produces a false effect. Practically it means the mutual adjustment of at least three different sets of three variable factors with almost mathematical accuracy. The printing processes are still imperfect, but the discovery of new sensitisers for the photographic plates and fuller researches into theory and practice are bringing about constant improvements, and it seems likely that before long their use will be greatly extended.

Attention may be drawn to the very comprehensive exhibit of the L.C.C. School of Photographic Engraving, &c. (Nos. 253-259), illustrating the various stages of three-colour printing, and the colour filters, screens, inks and other appliances in use. Also to the series of colour plates and proofs, with original and final result, exhibited by the proprietors of "The Graphic" (No. 103).

Apart from the above-noted purely photographic colour processes, mention should be made of those in which photography only forms the basis for colour printing by ordinary methods, as in the beautiful specimens of coloured heliogravures exhibited by M.M. Manzi, Joyant et Cie. (formerly Goupil et Cie., Paris), in which the several

colours are applied by hand on a heliogravure plate and skilfully blended by the printer. Chromolithographic printing is in the same way applied to reproductions produced by photo-lithography, photo-algraphy or photo-collotype, and illustrations of all these methods will be found in the Exhibition.

It may also be noted that with most of the photo-mechanical processes more or less hand work may be required to produce a satisfactory result. Photography is used only as a means of facilitating accurate reproduction.

J. WATERHOUSE.

Eltham, *January*, 1905.

1-B

HISTORIC SECTION.

CASE No. 1.

1. IMPRESSION FROM A PEWTER HÉLIOGRAPH PLATE. "Cardinal Amboise." By Monsieur N. Niépce, 1824.

Lent by Mrs. H. Baden Pritchard.

2. (*a*) MANUSCRIPT NOTES by Monsieur N. Niépce on "Héliographie—Dessins et Gravures;" with a letter from F. Bauer, dated 7th May, 1829.

Lent by Mrs. H. Baden Pritchard.

(*b*) MANUSCRIPT "NOTES SUR L' HÉLIOGRAPHIE," by Monsieur N. Niépce, dated 8th December, 1827.

Lent by Mrs. H. Baden Pritchard.

3. FIRST PHOTOGRAPH FIXED FROM NATURE. Obtained by Monsieur N. Niépce in 1827.

4. PHOTO-ENGRAVING by Fox Talbot, showing method of producing grain by folded crape.

Lent by C. H. Talbot, Esq.

5. PHOTO-ENGRAVING by Fox Talbot. Fern leaves: showing crape veil.

Lent by C. H. Talbot, Esq.

6. PHOTO-ENGRAVING by Fox Talbot. Fern leaf: showing crape veil. May, 1857.

Lent by C. H. Talbot, Esq.

7. PHOTO-GLYPHIC ENGRAVING: plate and print by H. Fox Talbot.
Scene in Java.

Property of the Museum.

8. PHOTO-LITHOGRAPHIC PROOF and a Negative printed on caoutchouc paper ready for transfer to stone. Made in 1865 by Sir Joseph Wilson Swan, F.R.S.

Produced by a negative carbon print developed on india-rubber paper, and transferred to stone. The caoutchouc becomes attached to the stone except where prevented from contact by the gelatine in the print, and it is receptive of lithographic ink.

Lent by Donald Cameron-Swan, Esq.

9. INTAGLIO PLATE made in 1864 by Sir Joseph Wilson Swan, F.R.S., for his "Photo-Mezzotint" Process.

This process consisted in obtaining an image in which the shadows are in relief and the whites depressed, by exposing bichromated gelatine under a suitable negative to the action of light, and afterwards to water. From the gelatine an electrotype is obtained, with the lights in relief, and the shadows depressed, as in an engraved copper plate. This intaglio is now filled with a thick solution of gelatine, containing Indian ink, or other colouring matter mixed with it; when slightly set and the surface cleaned as in copper plate printing, it is placed in contact with paper prepared to prevent its being absorbent; the cliché is then brought into firm contact by steady heavy pressure. The set gelatine and colour are thus delivered on to the paper, much in the same way that the cook delivers a shape of jelly from its mould. The resulting picture in all respects resembles a carbon print. The deepest shadows consist of a thick opaque layer forming blacks, each gradation from these to white consisting of a thinner layer of the translucent material.

Lent by Donald Cameron-Swan, Esq.

10. PHOTO-MEZZOTINT. Landscape from Nature. Example of the above process. May, 1864.

Lent by Donald Cameron-Swan, Esq.

BAY 1.

11. PHOTO-GLYPHIC ENGRAVING: plate and print by H. Fox Talbot, 1866.

Avignon.

Property of the Museum

12. PHOTO-GLYPHIC ENGRAVING: plate and print by H. Fox Talbot.

Portal of St. Trophime, Arles, 1866.

Property of the Museum.

13. PHOTO-GLYPHIC ENGRAVING: plate and print by H. Fox Talbot.

Church of St. Maurice, Vienne, France, 1866.

Property of the Museum.

14. PRINT by the mechanical process of Paul Pretsch. Fountain called Der Schöne Brunnen, Nuremberg.

Lent by Robert Sabine, Esq., to the Museum.

15. PRINT by the mechanical process of Paul Pretsch. Arch of Septimius Severus and Column of Phocas, Rome.

Lent by Robert Sabine, Esq., to the Museum.

16. PRINTS by the mechanical process of Paul Pretsch, 1860.

(*a*) Lunar photograph.

(*b*) A dying warrior.

(*c*) A horse laden with a dead stag.

(*d*) Portal of Strasburg Cathedral.

Lent by Warren De la Rue, Esq., F.R.S., to the Museum.

17. PHOTO-GALVANOGRAPHY by Paul Pretsch's process. By José Leipold, Lisbon.

Gateway of St. Jerome, Belem, near Lisbon.

Lent by Major-General J. Waterhouse.

18. PHOTO-ELECTRIC ENGRAVING by D. C. Dallas' process. Banqueting Hall, Kenilworth, 1864.

PHOTO-ELECTRIC ENGRAVING by Paul Pretsch's process. By the Photo-Galvanographic Co., 1857.

View of Richmond, Yorkshire.

Lent by Major-General J. Waterhouse.

19. PHOTO-ETCHING by the Bitumen process. By Amand Durand, Paris, about 1867.

Mill, after Rembrandt.

Central group from Paul Delaroche's Hémicycle.

Lent by Major-General J. Waterhouse.

20. PHOTO-ETCHING by the Bitumen process. By the Reichsdruckerei, Berlin.

Vase (in line).

Der Alte König, 1868.

Lent by Major-General J. Waterhouse.

21. PHOTO-ELECTROTYPE. Collochromate method. By E. Drivet & Cie., Paris.

Tourelle de l'hôtel de Marisy, Troyes.

The Kutb Minar, Delhi.

Lent by Major-General J. Waterhouse.

22. PHOTO-ELECTROTYPE by E. Drivet & Cie., Paris. "Manufacture Imp^le de Sèvres—Vases du Musée Céramique."

Property of the Museum.

23. HELIOGRAVURE AFTER NATURE, by E. Drivet & Cie., Paris.

Heather.

Heather.

Acquired in 1869.

Property of the Museum.

24. HELIOGRAPHIE DIRECT FROM NATURE, by the Placet process.

Cathedral of Rheims.

Tympan—Légende de Saint Remy.

Group of cherubs with a goat.

Property of the Museum.

25. PHOTO-ELECTROTYPE by the Military Geographical Institute. Vienna. Mariot's process.

Two views of forests, from drawings.

Lent by Major-General J. Waterhouse.

26. PHOTO-ELECTROTYPE by R. Falk, Berlin.

Der Schlafende Amor.

Lent by Major-General J. Waterhouse.

27. PHOTO-ELECTROTYPE. Collochromate method.

Portion of a frieze from the caves of Orissa (Ráni Gumphá).

Tannin grain plate, 1877.

Map in half tone.

Tannin grain plate, 1878.

Roof of Norwich Cathedral.

Waxed-sand grain process, 1881.

Cattle.

Waxed-sand grain process, 1881.

View of Kanchanjinga from Darjeeling.

Waxed-sand grain process, 1883.

Lent by Major-General J. Waterhouse.

28. PHOTO-ETCHING. Collochromate method. By H. Garnier. Paris, 1867.

Château de Maintenon.

Lent by Major-General J. Waterhouse.

29. HELIO-ENGRAVING APPLIED TO TOPOGRAPHY. Copper plate and proof. By Captain Hannot, Belgium.

A Map.

Property of the Museum.

30. HELIO-ENGRAVING APPLIED TO TOPOGRAPHY. Copper plate and proof. By Captain Hannot, Belgium.

A Map.

Property of the Museum.

31. HELIOGRAPHIC PLATE (electrotyped iron) and proof. St. Petersburg.

A watchman.

Property of the Museum.

32 HELIOGRAPHIC PLATE (electrotyped copper) and proof. St. Petersburg.

Cupids.

Property of the Museum.

33. PHOTO-ETCHING. Talbot-Klic method. Survey of India Photographic Office, Calcutta.

Arab and Somali ornaments from Aden. 1884.

Ivory carvings, Bengal. Single-fluid Etching, 1885.

Old Panjdeh. From a sketch. 1885.

Lent by Major-General J. Waterhouse.

34. PHOTO-ENGRAVING IN COLOUR, by A. Dawson, London.

The Gamekeeper and the Gipsies' Camp. After Morland. About 1880.

The Sportsman's Return. After G. Morland.

Lent by Major-General J. Waterhouse.

BAY 2.

35. PHOTO-ETCHING: illustrating use of reversed positives obtained by thio-carbamide reversals direct in camera. By the Survey of India Photographic Office, Calcutta, 1891.

Locust (*Acridium peregrinum*) with its transformations. Ordinary process of photo-etching from the original drawing.

Locust (*Acridium peregrinum*) with its transformations. Photo etching from a direct reversed transparency of the original drawing made by the thio-carbamide method.

Lent by Major-General J. Waterhouse.

36. PHOTO-ETCHING. Chloride of silver etching process on copper, by J. B. Obernetter, Munich, 1889.

"Flucht vor dem Feind."

Lent by Major-General J. Waterhouse.

37. PHOTO-ETCHING, by the Survey of India Photographic Office, Calcutta.

A piece of Indian ornament.

View in Strasburg.

From direct reversed camera transparencies of the original made by the thio-carbamide method.

Street scene in Hyderabad, Deccan.

The Hooghly Railway Bridge, 1890.

Royal Botanic Garden, Calcutta, 1890.

By the ordinary Talbot-Klic process.

Lent by Major-General J. Waterhouse.

38. PHOTO-ETCHING. Klic process.

Portrait of Princess Alice of Hesse. Riffarth, Berlin.

Bei ernster Arbeit. J. B. Obernetter, Munich, 1890.

Vagt Parade. G. Albert, Munich.

Lent by Major-General J. Waterhouse.

39. PHOTO-LITHOGRAPHY by Lemercier, Lerebours, Barreswil, and Davanne. Executed about 1852. (Early, if not earliest specimens of the art.)

St. Loup de Naud.

Strasburg. Portal and sculptured tympanum.

Property of the Museum.

40. PHOTO-LITHOGRAPHY by Leinercier, Lerebours, Barreswil and Davanne. Executed about 1852.

Front of a church.

Cluster of pillars with sculptured figures.

Property of the Museum.

41. PHOTO-LITHOGRAPHY. Line-work. Collochromate methods. By J. W. Osborne, Crown Lands Office, Melbourne.

Scale map of country lands.

Portrait head of a man. Transfer print, 1863.

Lent by Major-General J. Waterhouse.

42. PHOTO-LITHOGRAPHY. Half tone. Bitumen method. Eckstein's photo-chromolitho engraving on stone.

A cannon. Topographic Bureau, The Hague, 1864.

Gorge de St. Étienne. Marie's process.

Lent by Major-General J. Waterhouse.

43. PHOTO-LITHOGRAPHY by Eckstein's process. 1890. By the inventor, C. A. Eckstein, Director of the Topographical Establishment of the War Office at the Hague, Holland, 1892.

A cannon on a boat.

A cannon on a rampart.

Property of the Museum.

44. HELIOGRAVURE by Eckstein's process.

A view in a wood.

Property of the Museum.

45. HELIOGRAVURE by Eckstein's process. Colour partly printed on stone with the outline and partly filled in with hand.

A seascape.

Property of the Museum.

46. HELIOGRAVURE by Eckstein's process.

A view of underwood.

Property of the Museum.

47. HELIOGRAVURE by Eckstein's process. 1892.

Profile of a girl.

Property of the Museum.

48. PHOTO-TYPE BLOCK WITH PROOF.

Ordnance map.

Property of the Museum.

49. Sir William Abney's Papyro-type Process. Transfer ready for zinc.

Ordnance map *Property of the Museum.*

50. Sir William Abney's Papyro-type Process. Transfer executed at the School of Military Engineering, Chatham.

Title-page of "Punch."

Property of the Museum.

51. Sir William Abney's Papyro-type Process. Executed at the School of Military Engineering, Chatham.

Title-page of "Punch" and fac-simile print.

Property of the Museum.

52. Sir William Abney's Papyro-type Process.

Impression from a sketch in monochrome.

Property of the Museum.

53. Photo-zincographic Plate, prepared for printing.

Ordnance map.

Property of the Museum.

54. Photo-lithography by the papyro-tint process introduced by Sergeant-Major J. Husband, Royal Engineers' School of Military Engineering, Chatham. 1880.

View of Tintern Abbey.

Property of the Museum.

55. Photo-lithography. Half-tone. Bitumen method.

By Reiffenstein and Roesch, Vienna. 1868.

Two landscapes.

Lent by Major-General J. Waterhouse.

56. Photo-lithography. Collochromate method.

Engraving after Watteau.

A Gun.

Poitevin's process, about 1868. By Pinet.

The Prisoner of Gisors. After E. H. Wehnert.

By J. Ramage, Edinburgh.

Lent by Major-General J. Waterhouse.

BAY 3.

57. Photo-lithography. Line-work. Collochromate method.

By J. Leth, Vienna, 1868.

Repose in Egypt. Wood-cut by Albrecht Dürer.

Christ taken by the Jews. Wood-cut by Albrecht Dürer.

Lent by Major-General J. Waterhouse.

58. PHOTO-ZINCOGRAPHY. Southampton process, 1867.
Stonehenge. Half-tone photo-zincograph.
Fathers of the Church defending the doctrine of the Eucharist. Engraving after Rubens by S. à Bolswert.
Lent by Major-General J. Waterhouse.

59. PHOTO-LITHOGRAPHY. Half-tone. Collochromate method. 1868.
Head of Christ. By Simonau and Toovey, Brussels.
Bracket. By Keller and Giesemann, Berlin.
Carved panel. Poitevin's process.
Lent by Major-General J. Waterhouse.

60. PHOTO-LITHOGRAPHY. Half-tone. Collochromate method. By J. Leth. Vienna. About 1868.
Plateau.
Lent by Major-General J. Waterhouse.

61. PHOTO-LITHOGRAPHY. Heliographic process of Asser and Toovey. By Simonau and Toovey, Brussels.
Portrait of Asser.
Landscape. After an engraving.
A portrait.
Lent by Major-General J Waterhouse.

62. PHOTO-COLLOTYPE IN COLOUR. By E. Sieger, Vienna, 1888.
View of Berchtesgaden.
Lent by Major-General J. Waterhouse.

63. PHOTO-ZINCOGRAPHY. By the Survey of India Photographic Office, Calcutta. 1885.
Bhootia Teapot. From transfer with collotype grain.
Document with signature of Warren Hastings. 1776.
Lent by Major-General J. Waterhouse.

64. PHOTO-ZINCOGRAPHY.
Map of Ancient Britain.
Lent by the Ordnance Survey Office, Southampton.

65. PHOTO-ZINCOGRAPHY.
Magna Charta.
Lent by the Ordnance Survey Office, Southampton.

66. PHOTO-ZINCOGRAPHY.

A letter referring to the process.

Lent by the Ordnance Survey Office, Southampton.

67. PHOTO-ZINCOGRAPHY.

Netley Abbey.

Lent by the Ordnance Survey Office, Southampton.

68. PHOTO-ZINCOGRAPHY.

The Scottish Covenant.

Lent by the Ordnance Survey Office, Southampton.

69. PHOTO-ZINCOGRAPHY. 1863.

Temple of Luxor, Thebes.

Cairo.

Lent by the Ordnance Survey Office, Southampton.

70. PHOTO-RELIEF PRINTING. Woodbury's Process, including the first mould from which a Woodbury-type print was produced, 1864.

These are printed in carbon from metal blocks, obtained by hydraulic pressure from gelatine reliefs, all untouched.

Property of the Museum

71. PHOTO-RELIEF PRINTING. Woodbury process.

Portrait of Mr. Woodbury, and stannotype block.

Property of the Museum

72. VIDAL PROCESS IN COLOUR.

Enamel shrine.

Limoges enamel portrait.

Property of the Museum

73. PHOTO-COLLOTYPE.

Capella imparfeita of Monastery of Batalha, Lisbon. By Carlos Relvas, Gollega, Portugal, about 1880 or earlier.

Reproduction of a line engraving. About 1880 or earlier.

Lent by Major-General J. Waterhouse.

74. HELIOTYPE.

Amorini.

Lent by Messrs. B. J. Edwards & Co.

75. PHOTO-COLLOTYPE. By Tessié du Mothay and Maréchal, Metz. About 1868 or earlier. One of the earliest photo-collotypes.
Copy of lace shawl.
WOODBURY PROCESS PRINT from stannotype plate.
Crystal Palace.
Lent by Major General J. Waterhouse.

76. HELIOTYPE ON DRAWING PAPER. By the School of Military Engineering, Chatham, 1876.
Sketch from an old Master.
Study of a tree.
Rochester Castle.
West door of Rochester Cathedral.
Property of the Museum.

77. HELIOTYPE. 1870–71.
Dean's Canopy, St. Paul's Cathedral, by Grinling Gibbons.
Lent by Major-General J. Waterhouse.

78. PHOTO-AQUARELLE. By C. Jacobi, Venice. About 1880.
Pole-cat in a trap.
Lent by Major-General J. Waterhouse.

79. PHOTO-COLLOTYPE. About 1867.
Page of a manuscript.
Wall decoration from an engraving after J. Le Pautre.
Property of the Museum.

80. PHOTO-COLLOTYPES. By the Survey of India Photographic Office, Calcutta.
Carved sandalwood casket, from Mysore (scale $\frac{1}{3}$). 1884.
Ruins of Dimapur. 1874.
Portion of the frieze from the upper verandah of the Ráni Gumphá (sculptures from Orissa). 1874.
100-gold-Mohur Piece (full size). 1885.
Lent by Major-General J. Waterhouse.

81. PHOTO-COLLOTYPE IN COLOUR. Prepared at the State Paper Manufactory, St. Petersburg, about 1878.
Group of Amorini, after P. P. Rubens.
Patterns of textile fabrics.
Lent by George Clulow, Esq.

82. PHOTO-COLLOTYPE, by Major-General J. Waterhouse, Calcutta.
Leaf insect. Tannin films. 1871.
Naga Girl. Bi-chloride of mercury film. 1875.
Lent by Major-General J. Waterhouse.

GREAT BRITAIN.

BAY 4.

Maurice B. ADAMS, F.R.I.B.A.

83. PHOTO-LITHOGRAPHY, from a drawing.
Entrance to Corsham Alms Houses, Wilts.

84. THE ORIGINAL DRAWING.
Entrance to Corsham Alms Houses, Wilts.

85. PHOTO-LITHOGRAPHY, from a drawing.
Portico de la Gloria, Santiago, Spain.

86. THE ORIGINAL DRAWING.
Portico de la Gloria, Santiago, Spain.

87. PHOTO-LITHOGRAPHY, from a drawing.
Grand Staircase, Blickling Hall, Norfolk.

88. THE ORIGINAL DRAWING.
Grand Staircase, Blickling Hall, Norfolk.

89. PHOTO-LITHOGRAPHY from a drawing.
Stokesay Castle, Shropshire.

90. THE ORIGINAL DRAWING.
Stokesay Castle, Shropshire.

The ART REPRODUCTION CO., LTD.

91. PHOTOGRAVURE from a painting.
His Last Proposal. By H. P. Dollman.

92. PHOTOGRAVURE from a painting.
The Cider Press. By Frank Brangwyn, A.R.A.

93. PHOTOGRAVURE from a painting.
Highlanders. By Douglas Cameron.

94. PHOTOGRAVURE from a painting.

Portrait of Mrs. Carnac. By Sir Joshua Reynolds, P.R.A

95. PROCESS ENGRAVING IN COLOUR from a drawing.

Portrait Study. By C. W. Bartlett.

96. PHOTOGRAVURE from a painting.

Portrait of the Duke of Beaufort, K.G.

97. PHOTOGRAVURE IN COLOUR from a painting.

Bath of Psyche. By Lord Leighton, P.R.A.

98. PHOTOGRAVURE from a painting.

Portrait of Mrs. Robinson as Perdita. By Thomas Gainsborough, R.A.

ALLEN & CO.

99. PHOTOGRAVURE from a painting.

Portrait of John Ruskin. By G. Richmond, R.A.

100. PHOTOGRAVURE from a painting.

The Boyhood of Raleigh. By Sir J. E. Millais, Bt., P.R.A.

101. PHOTOGRAVURE from paintings and drawings.

Mer-de-Glace, Chamouni.

Port Ruysdael.

Dudley Castle.

The Passage of Mont Cenis.
By J. M. W. Turner, R.A

102. PHOTOGRAVURE from drawings.

Lancaster Sands.

Pilot Hailing a Smack.
By J. M. W. Turner, R.A

CASE No. 2.

The Proprietors of "THE GRAPHIC."

103. HALF-TONE COLOUR PROCESS.

(*a*) Original Drawing, "The Pensioner." By J. H. Bacon, A.R.A.
(*b*) Plate for yellow.
(*c*) Print in yellow.
(*d*) Plate for red.
(*e*) Print in red.
(*f*) Print in yellow and red.
(*g*) Plate for blue.
(*h*) Print in blue.
(*i*) Finished print in three colours.

BAY 5.

Count OSTRORÖG.

104. PHOTOGRAVURE from a painting.
"Santa Claus." By Maude Goodman.

105. PHOTOGRAVURE from a painting.
"Caledonia." By J. MacWhirter, R.A.

The AUTOTYPE CO.

106. AUTOGRAVURE from a painting.
The Fighting Temeraire. By J. M. W. Turner, R.A.

107. AUTOGRAVURE from a painting.
Portrait of the Right Hon. Lord Kitchener of Khartoum. By A. S. Cope, A.R.A.

108. AUTOGRAVURE from a painting.
Moorland Rovers. By Peter Graham, R.A.

109. AUTOGRAVURE from a painting.
The Haywain. By John Constable, R.A.

T. & R. ANNAN & SONS,

110. PHOTOGRAVURE from a painting.
Portrait of His Grace Archbishop Eyre. By Sir J. Guthrie, P.R.S.A.

111. PHOTOGRAVURE from paintings.
Portraits (three). By J. S. Sargent, R.A.

112. PHOTOGRAVURE from paintings.
Portraits (six). By Sir Henry Raeburn, R.A.

BAY 6.

WALKER & COCKERELL.

113. PHOTOGRAVURE from sculpture.

Pilaster of the Fontaine des Innocents.

Diana.

Bas-reliefs of the Fontaine des Innocents. By Jean Goujon.

114. PHOTOGRAVURE from paintings.

Rockets and Blue Lights. By J. M. W. Turner, R.A.

Old Mill on the Yare. By G. Vincent.

The Wreckers. By George Morland.

Lowther Castle. By Peter De Wint.

115. PHOTOGRAVURE from paintings.

Portrait of Izaak Walton. By Jacob Huysman.

Portraits of Jane, Duchess of Gordon, and Son. By George Romney.

116. PHOTOGRAVURE from paintings.

Portraits of Lady Hamilton. By George Romney.

117. PHOTOGRAVURE from paintings.

Portrait of General Wolfe. By Thomas Gainsborough R.A.

Portrait of Mrs. Fitzherbert. " "

The REMBRANDT INTAGLIO PRINTING Co., Ltd.

118. PHOTOGRAVURE from a painting.

Portrait of Georg Gisze. By Hans Holbein.

119. PHOTOGRAVURE from a painting.

Portraits of Thomas Carew and Sir William Killigrew. By Sir Anthony van Dyck.

120. PHOTOGRAVURE from a painting.

Castle Bentheim. By Jacob van Ruisdael.

121. PHOTOGRAVURE from a painting.

Portraits of the Duke and Duchess of Cumberland. By Thomas Gainsborough, R.A.

WARD & CO.

122. PHOTOGRAVURE from a painting.
Dame Evans of Eton. By John S. Sargent, R.A.

123. PHOTOGRAVURE from a painting.
"For he had great possessions." By G. F. Watts, O.M. R.A.

124. PHOTOGRAVURE from a painting.
Portrait of Lord Roberts. By A. S. Cope, A.R.A.

BAY 7.

The MEISENBACH Co., Ltd.

125. HALF-TONE PHOTO-LITHOGRAPHY.
Cherry Girl.

126. MEISENGRAVURE. Intaglio half-tone.
Views (two) from nature.
The Prioress' Tale. From a painting by Sir E. Burne-Jones, Bt.

CASE No. 3.

127. MEISENGRAVURE. Plates showing the progressive stages of the process. Negative; Positive; three Plates and a Print.

BAY 7.

Robert SANSON.

128. PHOTOGRAVURE from a mezzotint engraving.
"A Gentleman Goffer." By Valentine Green, after L. F. Abbott.

129. PHOTOGRAVURE from a line engraving.
Portrait of Robert Burns. After Alexander Nasmyth.

130. PHOTOGRAVURE from a mezzotint engraving.
Portraits of the children of the Honourable John Douglas. By James Ward, R.A., after John Hoppner, R.A.

The ART PHOTOGRAVURE Co., Ltd.

131. PHOTOGRAVURE IN COLOUR (one printing) from an oil painting.
Figure subject. By W. Oliver

132. PHOTOGRAVURE IN COLOUR (one printing), a water-colour painting.

Figure subject. By R. Sauber.

133. PHOTOGRAVURE IN COLOUR (one printing) from an oil painting.

Portrait of H.M. the late Queen Victoria. By Benjamin Constant.

134. PHOTOGRAVURE IN COLOUR (one printing) from a painting.

"Her Choice." By Sydney Kendrick.

135. PHOTOGRAVURE from a painting.

A portrait. By A. S. Cope, A.R.A.

136. PHOTOGRAVURE from life.

Portrait of Mr. Justice Buckley.

137. PHOTOGRAVURE from life.

Portrait of Mrs. Lewis Waller.

138. PHOTOGRAVURE from a painting.

Portrait of Lord Goschen.

139. PHOTOGRAVURE from life.

Portrait of the Lord Chancellor.

BAY 8.

Raphael TUCK & Sons, Ltd.

140. HALF-TONE COLOUR PROCESS.

Nicholas Nickleby's departure for Dotheboys Hall—*Charles Dickens.* By Ludovici.

141. HALF-TONE COLOUR PROCESS.

The meeting of Pip and Estella at the Inn yard—*Charles Dickens.* By Ludovici.

142. PHOTOCHROME from a painting.

Mirrored Nature. By David Murray, R.A.

143. PHOTOCHROME from a painting.

The Grand Canal, with the Bridge of Sighs, Venice. By J. M. W. Turner, R.A.

NATIONAL LIBRARY

144. HALF-TONE COLOUR PROCESS from a painting.
Steam Tug in a storm. By Professor Van Hier.

145. HALF-TONE COLOUR PROCESS from a painting.
Moonlit Waters. By Professor Van Hier.

146. HALF-TONE COLOUR PROCESS from a painting.
To the Rescue. By Professor Van Hier.

147. HALF-TONE COLOUR PROCESS from a painting.
Moonlight on the Thames. By Professor Van Hier.

148. PHOTOGRAVURE from a painting.
Birks and Brackens. By J. McWhirter, R.A.

149. PHOTOGRAVURE from a painting.
Grandfather's Recollections. By Watson Nichol.

150. PHOTOGRAVURE from a painting.
The Green Punt. By Alfred Parsons, A.R.A.

151. PHOTOGRAVURE from a painting.
Blossoms. By Marcus Stone, R.A.

152. FAC-SIMILE PROCESS from a drawing.
In the Golden Summer Time. By Marcus Stone, R.A

153. FAC-SIMILE PROCESS from a drawing.
In the Spring of the Year. By Marcus Stone, R.A.

J. J. WADDINGTON, Ltd.

154. PHOTOGRAVURE from a painting.
Portrait of William Hughes, President of the Institute of Actuaries. By Harold Speed.

155. PHOTOGRAVURE from a painting.
Portrait of Robert Giles, C.I.E. By Harold Speed.

156. PHOTOGRAVURE from paintings.
St. Eulalia. By J. W. Waterhouse, R.A.
Vanessa Stephen. By C. W. Furse, A.R.A.

157. PHOTOGRAVURE from a painting.
The Glory of Autumn. By A. Thorburn.

158. PHOTOGRAVURE from nature.
View in Ely Cathedral.

159. PHOTOGRAVURE.
Illustrations (four) for "Historical Monographs."

160. PHOTOGRAVURE.
Title-pages and portraits (eight).

161. PHOTOGRAVURE from a drawing.
A Lady seated in a Library.

162. WADDINGTONE PROCESS (two printings) from drawings and from nature.
Six examples.

BAY 9.

John SWAIN & SON, Ltd.

163. HALF-TONE COLOUR PROCESS from drawings.
Landscapes (three). By Sir Harry Johnston.
The property of "The Graphic."

164. HALF-TONE COLOUR PROCESS.
Six miscellaneous subjects.

165. HALF-TONE COLOUR PROCESS from drawings.
Two figure subjects.

The STRAND ENGRAVING CO. Ltd.

166. HALF-TONE COLOUR PROCESS from drawings.
Pictorial Post Cards (six).

167. HALF-TONE COLOUR PROCESS from coloured photographs.
Woollen Pile Carpet belonging to the Girdler's Company.
Tapestry, "Hunting Scene," at Hardwick Hall.

168. HALF-TONE COLOUR PROCESS from drawings.
Pictorial Post Cards (six).

The SWAN ELECTRIC ENGRAVING CO.

169. PLATES (four) and PROOF showing stages in the making of a photogravure plate.

170. PHOTOGRAVURE from a painting.
The Meeting of Burns and Scott. By C. Martin Hardie, A.R.S.A.

171. PHOTOGRAVURE from a painting.
Portrait of the Rt. Hon. Sir John C. Day. By Prince Troubetskoy.

172. PHOTOGRAVURE from a painting.
An Ordination of Elders in a Scottish Kirk. By J. H. Lorimer, R.S.A.

173. PHOTOGRAVURE from life.
Portrait of Sir Joseph Wilson Swan, D.Sc., M.A., F.R.S.

174. PHOTOGRAVURE from nature.
The Foaming Torrent. From a Photograph by Donald Cameron-Swan, F.S.A. (Scot.)

175. SWAN-LINE ETCHINGS from pen drawings.
Book plates (three).

176. SWAN-LINE ETCHINGS from pen drawings.
Tomb of Caius Cestius, Rome. By Joseph Pennell.
Albi. By Joseph Pennell.
The Antiquarian.

177. HALF-TONE COLOUR PROCESS. Two printings.
Illustrations for books (six).

Carl HENTSCHEL, Ltd.

178. HENTSCHEL COLOUR-TYPE PROCESS from an engraving.
Fencing. By T. Rowlandson, 1787.
The property of "The Graphic."

179. HENTSCHEL COLOUR-TYPE PROCESS from an oil painting.
Portrait of H.M. the King. By Emil Fuchs.
The property of "The Graphic."

180. HENTSCHEL COLOUR-TYPE PROCESS from an oil painting.
Cupids. By G. F. Watts, O.M., R.A.

181. HENTSCHEL COLOUR-TYPE PROCESS from a painting.
The Age of Innocence. By Sir Joshua Reynolds, P.R.A.
The property of "The Graphic."

182. HENTSCHEL COLOUR-TYPE PROCESS from water-colour drawings.
Illustrations (eight) for "Happy England." By Mrs. Allingham.
The property of Messrs. A. & C. Black.

183. HENTSCHEL COLOUR-TYPE PROCESS from water-colour drawings.
Illustrations (eight) for "Happy England." By Mrs. Allingham.
The property of Messrs. A. & C. Black.

184. HENTSCHEL COLOUR-TYPE PROCESS from water-colour drawings.
Illustrations (six) for "Happy England." By Mrs. Allingham.
The property of Messrs. A. & C. Black.

185. HENTSCHEL COLOUR-TYPE PROCESS from nature.
Flowers in a conservatory.

186. HENTSCHEL COLOUR-TYPE PROCESS from a pastel drawing.
Head of a Child.
The property of "The Graphic."

187. HENTSCHEL COLOUR-TYPE PROCESS from a water-colour drawing.
The Dutchman. By Mortimer Menpes.
The property of Messrs. A. & C. Black.

188. HENTSCHEL COLOUR-TYPE PROCESS from a painting.
"A Peaceful Moment." By Stanhope Forbes, A.R.A.
The property of "The Graphic."

189. HENTSCHEL COLOUR-TYPE PROCESS from paintings.
Ellen Terry as "Lady Macbeth." By J. S. Sargent, R.A.
Sir Henry Irving as "Hamlet." By E. Long, R.A.

190. HENTSCHEL COLOUR-TYPE PROCESS from a painting.
"A Water Baby." By Mrs. Marion Cox.
The property of Messrs. A. & F. Pears, Ltd.

BAY 10.

BEMROSE & SONS, Ltd.

191. GRANOTYPE process in four printings.
Illustrations for books (three).

192. GRANOTYPE process in four printings.
Illustrations for books (two).

193. GRANOTYPE process in four printings.
Illustrations for books (two).

194. GRANOTYPE process in four printings.
Illustrations for books (two).

CLAMP & WILBERT, Ltd.

195. THREE COLOUR LITHOGRAPHY.
Group of Flowers in the various stages of production.

196. ORIGINAL CHROMO-LITHOGRAPH OF THE GROUP OF FLOWERS.

197. THREE COLOUR LITHOGRAPHY.
The Late Pope Leo XIII.
Original Chromo-lithograph of the late Pope Leo XIII.

198. THREE COLOUR LITHOGRAPHY.
Landscape with Trees.

F. WETHERMAN & Co., Ltd.

199. ARISTOCHROM from a painting.
The Haywain. By John Constable, R.A.

200. COLLOTYPE from a painting.
A Corner of my Studio. By Sir L. Alma-Tadema, R.A.

201. COLLOTYPE from a painting.
Flatford Mill. By John Constable, R.A.

202. COLLOTYPE from a painting.
The Reaper and the Flowers. By Phil Morris, A.R.A.

203. ARISTOCHROM from a painting.
Blossoms. By Albert Moore.

204. COLLOTYPE from a painting.
Britannia's Realm. By J. Brett, A.R.A.

205. COLLOTYPE from a painting.
Maid and Magpie. By Sir Edwin Landseer, R.A.

206. COLLOTYPE from a painting.
Returning to the Fold. By H. W. B. Davis, R.A

207. COLLOTYPE from a painting.
The Pool of London. By Vicat Cole, R.A.

208. COLLOTYPE from a painting.
Burial of Atala. By Gustave Courtois.

HOBBS & Sons.

209. PHOTOCHROMO-LITHOGRAPHY, from a lithograph.

Heroes of the Goodwin Sands.

Lent by C. Harrap, Esq.

210. LITHOGRAPH from which the photochromo-lithograph has been enlarged.

Heroes of the Goodwin Sands.

Lent by C. Harrap, Esq.

ALGRAPHY, Ltd.

211. PHOTO-ALGRAPHY from paintings.

Friends.

The Glade.

212. PHOTO-ALGRAPHY from a photograph.

Miss Lily Hanbury as "Calphurnia."

W. J. BRUCE & Co.

213. PHOTOCHROMO-LITHOGRAPHY from water-colour drawings.

Fruit and flower panels (three). By Fräulein C. Klein.

BAY 11.

ANDRÉ & SLEIGH, Ltd.

214. HALF-TONE COLOUR PROCESS.

Illustrations for "French Porcelain in the Wallace Collection."

215. HALF-TONE COLOUR PROCESS.

Illustrations of Natural History and Scientific objects.

216. HALF-TONE COLOUR PROCESS.

Illustrations of Horticultural objects.

217. HALF-TONE COLOUR PROCESS from paintings.

Portraits at Hampton Court.

The property of "The Graphic."

218. HALF-TONE COLOUR PROCESS from paintings.
Examples of "The Nation's Pictures."

219. HALF-TONE COLOUR PROCESS from objects.
Illustrations for a Commercial Catalogue.

220. HALF-TONE COLOUR PROCESS from water-colour drawings.
Animals by Sir Harry Johnston.

221. HALF-TONE COLOUR PROCESS from a painting.
"The Fighting Temeraire." By J. M. W. Turner, R.A.

222. HALF-TONE COLOUR PROCESS from water-colour drawings.
Illustrations for G. S. Elgood's "English Gardens."

223. HALF-TONE COLOUR PROCESS from water colour drawings.
Illustrations for "On the old Road through France to Florence." By A. H. Hallam Murray.

SCREEN A.

EDE, ALLOM & TOWNSEND, Ltd.

224. HELIOCHROME from objects and engravings.
Illustrations for books, porcelain, etc.

225. HELIOCHROME from coloured engravings.
Coloured engravings after George Morland, John Leech, and others.

226. HELIOCHROME from miniatures.
Miniatures. By R. Cosway, R.A., and others.

The POLYTECHNIC SCHOOL OF PHOTOGRAPHY

227. EXAMPLES OF IRRADIATION ON THE PHOTOGRAPHIC FILM.

228. EXAMPLES OF IRRADIATION APPLIED TO PROCESS PLATES.

229. ADJUSTMENT OF THE THICKNESS OF FILM.

230. HALF-TONE PRINTS (four), graded exclusively by irradiation.

231. TRI-COLOUR REPRODUCTIONS (four). Direct process, graded mainly by irradiation.

232. HALF-TONE COLOUR PROCESS. Three printings.

A Man's Head. Direct from life.

233. HALF-TONE COLOUR PROCESS. Three printings; direct dry plate process from a water-colour drawing.

"Le Billet de Logement." By Léon Girardet.

234. THE ORIGINAL DRAWING.

"Le Billet de Logement." By Léon Girardet.

Walter L. BOURKE.

235. PHOTOGRAVURE from paintings.

Illustrations (six) for "The Bridgewater Gallery," by W. L. Bourke and Lionel Cust, M.V.O., from the original pictures in the possession of the Earl of Ellesmere.

BAY 12.

THE LONDON COUNTY COUNCIL SCHOOL of PHOTO-ENGRAVING and LITHOGRAPHY.

244. PHOTO-LITHOGRAPHY.

Six specimens.

245. PHOTO-LITHOGRAPHY.

Six specimens.

246. PHOTO-LITHOGRAPHY.

Twelve specimens.

247. PHOTOGRAVURE.

An Open Book. By Albert Moore.

248. PHOTOGRAVURE.

Views (two) of Looe, Cornwall.

249. PHOTOGRAVURE.

Five specimens.

250. PHOTOGRAVURE.

Stages of process.

251. PHOTOGRAVURE.

A Roman bath at Bath.

252. PHOTOGRAVURE.
The Bagpipes. By Joannes Massys.

253. TRI-COLOUR PROCESS.
Specimens.

254. SPECTRUM TESTS OF SOME TRI-COLOUR FILTERS.

255. TESTS OF ORTHO-CHROMATIC PLATES.

256. COMPONENT PRINTINGS.

257. ABSORPTION OF DYES USED IN MAKING TRI-COLOUR FILTERS

258. STAGES OF PROCESS; tri-colour half-tone (indirect).

259. EXAMPLES of tri-colour half-tone (indirect).

260. COLLOTYPE.
The Avenue. By M. Hobbema.

261. COLLOTYPE.
St. John the Baptist. By Albrecht Dürer.

262. COLLOTYPE. Stages of Process.

263. COLLOTYPE.
The William Hospital, York.

264. COLLOTYPE.
Book Cover.

265. ROTATING COPY-BOARD.

CASE No. 4.

266. MATERIALS USED IN TRI-COLOUR PROCESS, AND CHEMICALS USED IN COLLOTYPE.

A Small Cross-line Screen.

These screens are employed to translate the gradations of the original into varying sized dots for purposes of printing. They are held a short distance in front of the plate during exposure.

Two Models of Cross-line Screens.

When a series of straight lines cross each other, they give rise to pattern, which, when the angle between the lines is small, may be very pronounced. This in three-colour work is very objectionable, and in order to make the pattern formed least obvious, the screen is arranged so that the lines of dots cross each other at the maximum angle, which is 30°. This is effected either by rotating the copy, as shown by exhibit No. 265, by rotating a circular screen, or the use of a pair of screens, in one of which the rulings are 45°, and in the other at 15° and 75° to the base. In using the last arrangement one negative is made through the 45° screen, one through the second screen, which is

then turned before making the third negative. There is also another possible method of avoiding the pattern by the use of stops with peculiar apertures cut at the correct angles.

Two Filter Holders.

These illustrate two methods of using liquid light filters. In the first case a circular filter is held upon the hood of the lens, and in the second case a square filter is contained in a holder behind the lens.

Two Sets of Colour Filters.

Both liquid and dry filters are in general use.

A Set of Screen Negatives.

These are made with colour sensitised Collodion Emulsion through colour filter and cross-line screen at one operation.

Collodion Emulsion and Colour Sensitisers.

Collodion Emulsion possesses some of the advantages of wet plate, inasmuch as the negatives can be rapidly finished, it is more easily colour sensitised than wet plate; on the other hand, the range of gradation rendered by it is less than with colour sensitive dry plates.

Materials used in Wet Plate Operations.

The wet plate process is used to make the screen negative in "indirect" three-colour, *i.e.*, when the colour records are made without the cross-line screen being in position.

Materials used in making the Resist for Protecting the Surface of the Copper in Etching.

A fish skin from which fish glue is made, is shown.

The copper plate is coated with a thick solution of fish glue sensitised with a bichromate, dried by heat, and then printed in close contact with the screen negative in a strong frame. The plate is developed by soaking in cold water, and in order to render the image visible it is dyed in an aniline dye. After the plate is dry, it is heated until the resist forms an enamel. The plate, after spotting out any defects and protecting the back with varnish, is etched in a bath of perchloride of iron.

Materials used in Fine Etching.

In order to correct errors of the process, re-etching is generally required. After the block has been rough etched, it is rubbed with a block of carbonate of magnesia. This fills in with white the etched hollows of the plate, and so shows the detail on a white ground. The fine etcher can now stop out with a varnish those portions that are sufficiently dark, replace the plate in the etching solution, and etch those parts left uncovered until light enough.

Three Blocks, mounted type high, ready for Printing, together with separate and complete Proofs.

BAY 13.

The ORDNANCE SURVEY of the UNITED KINGDOM, Southampton.

PROCESS ENGRAVING OF MAPS.

267. MANUSCRIPT PLAN. 25-inch map. Somerset. 41·5.

268. ZINC PLATE. 25-inch map. Somerset. 41·5.

269. IMPRESSION. 25-inch map. Somerset. 41·5.

270. TWELVE INCH DRAWING. 6-inch map. Nottingham. 42 N.W.

271. HELIO PLATE. 6-inch map. Nottingham. 42 N.W.

272. IMPRESSION. 6-inch map. Nottingham. 42 N.W.

273. HELIO PLATE. 6-inch map. Northampton. 8 S.E.

274. IMPRESSION. 6-inch map. Northampton. 8 S.E.

275. ONE INCH DRAWING (four quarters). 2-mile map. England. Sheet 51.

276. ONE INCH DRAWING (four quarters). 2-mile map. England. Sheet 52.

277. HILL DRAWING. 2-mile map. England. Sheet 51.

278. IMPRESSION. 2-mile map. England. Sheet 51.

279. IMPRESSION. 2-mile map. England. Sheet 52.

280. HILL DRAWING. 4-mile map. Scotland. Sheet 11.

281. IMPRESSION. 4-mile map. Scotland. Sheet 11.

282. IMPRESSION. 4-mile map. Scotland. Sheet 14.

283. HILL DRAWING. 10-mile map. Great Britain. Sheet 5.

284. IMPRESSION. 10-mile map. Great Britain. Sheets 3 and 4.

285. IMPRESSION. 10-mile map. Great Britain. Sheets 5 and 6.

CASES Nos. 5 & 6.

286. Outline Copper Plate. 2-mile map. England. Sheet 51.

287. Water Copper Plate. 2-mile map. England. Sheet 51.

288. Hills Copper Plate. 2-mile map. England. Sheet 51.

289. Hills Copper Plate. 4-mile map. Scotland. Sheet 11.

290. Hills Copper Plate. 10-mile map. Great Britain. Sheet 5.

CASE No. 7.

291. Negative. 6-inch map. Nottingham. 42 N.W.

292. Negative. 6-inch map. Northampton. 8 S.E.

293. Outline Negative. 2-mile map. England. Sheet 51.

294. Water Negative. 2-mile map. England. Sheet 51.

295. Negative. 4-mile map. Scotland. Sheet 11.

296. Negative. 10-mile map. Great Britain. Sheet 5.

INDIA.

BAY 13.

The SURVEY of INDIA PHOTOGRAPHIC OFFICE, Calcutta.

297. PHOTO-ELECTROTYPE, from line drawings.

Mihrab in Balal Khan Quazi's Mosque, Dholka.

Doorway. From the Temple at Lakkundi.

298. PHOTO-ETCHING. Klic process.

Map of Andaman Islands in two colours and black. Hills drawn on ground glass. 1893.

Map of India in two printings. Outline from engraved copper plate. Hills drawn on ground glass and photo-etched.

Topographical Map of Calcutta. Added tints for roads and houses. 1892.

299. PHOTO-ETCHING.

Tusser Moths. From pencil drawing. 1890.

Cultivations of comma bacilli.

300. PHOTO-ETCHING.

Echinoderms. From drawings. 1894.

301. PHOTO-ETCHING.

Inlaid Salver of Koft Work. With details of ornament (full size). 1894.

302. PHOTO-ETCHING.

Ivory Carvings from Bengal. Etched with one solution. 1886.

Mango Trees. Dehra Dun. 1889.

303. PHOTO-ETCHING.

Action of Cobra-Venom on Blood. Printed in colour from two plates.

Action of Cobra-Venom on Blood. Four printings in colour. 1896.

304. PHOTO-ETCHING.

Shainsar Temple. Kulu. 1894.

Tomb of Salim Chisti, Fatehpur Sikri, near Agra.

305. PHOTO-ETCHING.

Mycetoma. Printed in four tints on one plate. 1891.

Biliary Cirrhosis. From drawings.

306. PHOTO-ETCHING.

Sheet of the Bower Manuscript. 1893.

307. PHOTO-ETCHING.

Simvo, Eastern Himalayas (reduced).

Simvo, Eastern Himalayas. 1892.

Lent by Major-General J. Waterhouse.

AUSTRO-HUNGARY.

AUSTRIA.

BAY 14.

Richard PAULUSSEN.

308. PHOTOGRAVURE IN COLOUR from a painting.

Breakers on the Riviera. By C. O'Lynch von Town.

309. PHOTOGRAVURE from a painting.

Rayons de Soleil. By Henri Houben.

310. PHOTOGRAVURE IN COLOUR from a painting.

Dreams of Love. No. 1. By R. Rössler.

311. PHOTOGRAVURE IN COLOUR from a painting.

Dreams of Love. No. 2. By R. Rössler.

C. ANGERER & GÖSCHL.

312. HALF-TONE COLOUR PROCESS (four printings) from a painting.

A Scout on Horseback.

313. HALF-TONE COLOUR PROCESS (three printings) from a painting.

The Story.

314. HALF-TONE COLOUR PROCESS (three printings) from a painting.

St. Stephen's Place, Vienna.

315. HALF-TONE COLOUR PROCESS (four printings) from a drawing.

Panoramic View of Vienna.

316. HALF-TONE COLOUR PROCESS (three printings) from a painting.

Pirano. By A. Wagner.

317. HALF-TONE COLOUR PROCESS from a painting.

H.M. King George of Saxony. By K. T. Bühringer.

318. HALF-TONE COLOUR PROCESS from a painting.

Two dogs. By Euphémie Muraton.

319. HALF-TONE COLOUR PROCESS (four printings).

Fairy Tale Pictures (four). By H. Lefler.

320. STEEL ENGRAVINGS.

Bill headings, etc.

321. ALGRAPHY. Engraved Aluminium Plate.

The Rabenstein.

Photograph printed direct on aluminium.

322. ALGRAPHY. Proof from the plate.

The Rabenstein.

323. HALF-TONE PROCESS. Copper plate, and an impression from the plate.

View in Corfu.

Shown for exceptional size.

BAY 15.

THE IMPERIAL STATE PRINTING PRESS, VIENNA.

324. COMBINATION PRINTING. COLLOTYPE TRANSFERRED TO STONE AND CHROMO-LITHOGRAPHY, from a painting.

Country Lane: Autumn. By Wisinger Florian.

325. COMBINATION PRINTING. COLLOTYPE AND ALGRAPHY from a painting.

Avenue of trees with group of figures. By H. Charlemont.

326. HALF-TONE AND CHROMO-LITHOGRAPHY from a painting.

"Eisenwerk bei Dobrisch." By H. Jakesch.

327. COLLOTYPE AND CHROMO-LITHOGRAPHY.

Illumination: the Dioskorides Codex.

328. CHROMO-COLLOTYPE from a drawing.

Study of two women and a child. By C. H. Shannon.

329. Coloured Photo-lithography from nature.

Dromedary.

330. Coloured Photo-lithography from nature.

Rhinoceros.

331. Coloured Photo-lithography from nature

Elephant.

332. Coloured Photo-lithography from nature.

Giraffe.

333. Photo-algraphy with a tint from a drawing.

Study of a woman's head. By F. Khnopff.

334. Combination Printing. Collotype and Chromo-lithography.

A Reliquary.

335. Half-tone Printing with a tint from a painting.

"Bacchanalians." By F. Stuck.

336. Combination Printing. Collotype transferred to stone and Chromo-lithography from a painting.

Moonlit Sea. By E. Kasparides.

337. Photogravure with two-colour Printings from a painting.

River View with Bridge. By E. Kasparides

338. Combination Printing. Collotype and Chromo-lithography from a water-colour drawing.

Harburg. By M. Feldbauer.

339. Combination Printing. Collotype and Chromo-lithography from a water-colour drawing.

Durnstein. After R. Alt.

SCREEN B.

BLECHINGER & LEYKAUF.

340. PHOTOGRAVURE IN COLOUR from a painting.
Nuns Singing. By A. Bedin.

341. PHOTOGRAVURE IN COLOUR from a painting.
Forest Scene: Winter. By M. Kurzwelly.

342. PHOTOGRAVURE IN COLOUR from a painting.
Ladies in a Punt. By Lucien Davies.

343. PHOTOGRAVURE IN COLOUR from a painting.
Nouvelle Statue. By H. Siemiradzki.

344. PHOTOGRAVURE from a painting.
Portrait of T. P. O'Connor, M.P. By John H. Bacon, A.R.A.

345. PHOTOGRAVURE from a painting.
Circus Maximus. By E. Forti.

346. PHOTOGRAVURE from a painting.
Un Rêve d'Amour. By F. Vinea.

347. PHOTOGRAVURE from a painting.
Die Seherin von Prevorst im Hochschlaf. By Gabriel von Max.

J. LÖWY.

344.* PHOTOGRAVURE.

345.* CHROMOPHOTOTYPE.

346.* COLLOTYPE.

347.* HALF-TONE COLOUR PROCESS.

HUNGARY.

BAY 16.

WEINWURM ANTAL.

348. HALF-TONE COLOUR PROCESS from oil paintings, water-colours and lithographs.

Illustrations for books, etc. (eleven).

349. HALF-TONE COLOUR PROCESS from nature, oil paintings, water-colours and lithographs.

Illustrations for books, etc. (nine).

S. HERBST.

350. ALGRAPHY. Ten aluminium plates and a proof.

A Branch of an Apple Tree.

FRANKLIN TARSULAT.

351. HALF-TONE COLOUR PROCESS from paintings.

Advice. By Tihamer von Margitay.

Quarrel. By Tihamer von Margitay.

352. HALF-TONE COLOUR PROCESS from paintings.

Portrait of Wlassics, Minister of Education. By László.

Portrait of Mrs. Hubay, Countess Czebrián. By László.

353. HALF-TONE COLOUR PROCESS from paintings.

On the Balaton. By Mészály.

A Farmyard. By Mészály.

354. HALF-TONE COLOUR PROCESS from oil paintings and drawings.

Landscapes (six). By A. Young and C. Geddes.

355. HALF-TONE COLOUR PROCESS from a painting.

Portrait of Francis Josef, Emperor of Austria and King of Hungary. By J. Kossak.

356. HALF-TONE COLOUR PROCESS from paintings.
"In the Woods." By Paal.
"Early Snow." By Katton.

357. HALF-TONE COLOUR PROCESS from paintings.
Portrait of Miss Küry. By J. Kossak.
Portrait of a lady. By Hirsch Nelli.

358. HALF-TONE COLOUR PROCESS from a painting.
Flowers. By Benezur.

359. HALF-TONE COLOUR PROCESS from paintings.
The Visit. By Paczka.
Market in Hungary. By L. Ebner.
Farewell. By Behari.

360. HALF-TONE COLOUR PROCESS from paintings.
Landscapes (six). By C. Geddes, J. Douglas and H. Barrow.

The ATHENÆUM LITERARY and PRINTING ESTABLISHMENT, Ltd.

361. PHOTOGRAVURE from a painting.
Madonna and Child. By G. Vastgh.

362. PHOTOGRAVURE IN COLOUR from a painting.
"The Little Artist." By János Valentiny.

363. PHOTOGRAVURE from drawings.
Book Illustrations for "Mohacs" (four).

364. HELIOTYPE from a painting.
Landscape and Stork. By Spányr.

365. HALF-TONE COLOUR PROCESS (three printings) from paintings and objects.
Illustrations for books (four).

366. HALF-TONE COLOUR PROCESS (three printings) from paintings.

A Festival. By Kimnach.

Peasants going to Church. By Krisch.

367. HALF-TONE COLOUR PROCESS (three printings) from paintings.

Illustrations for books (four).

368. HALF-TONE COLOUR PROCESS from paintings.

Madonna and Child with St. John the Baptist. By Raphael.

Portrait of a Man. By Sebastiano del Piombo.

369. HALF-TONE COLOUR PROCESS from paintings.

Banquet. By Révész.

In the ante-room of the Minister. By Margitay.

BELGIUM.

SCREEN C.

Établissements Jean MALVAUX. (Soc. Ame.)

374 HALF-TONE COLOUR PROCESS from water-colour drawings.
Menu Cards (four) in two sizes.

375. HALF-TONE COLOUR PROCESS from oil paintings.
The Four Seasons.

376. HALF-TONE COLOUR PROCESS from an oil painting.
Portrait of a Lady. By Flameng.

377. HALF-TONE COLOUR PROCESS from water-colour paintings.
Twelve examples.

378. HALF-TONE COLOUR PROCESS: enlargement.
Market Women, etc.

379. HALF-TONE COLOUR PROCESS (four printings).
Thirteen examples.

380. HALF-TONE COLOUR PROCESS from nature.
Nine Postcards.

381. HALF-TONE COLOUR PROCESS (en camaïeu).
Nine examples.

382. HALF-TONE COLOUR PROCESS (two printings).
Sixteen examples.

383. HELIOGRAVURE.
Fifteen examples.

BAY 17.

J. & P. JUMPERTZ.

384. COLLOTYPE, from nature.

Views (two) in the Botanic Gardens, Brussels.

385. COLLOTYPE, from objects.

Art objects (four).

386. COLLOTYPE, from objects.

Art objects (four).

387. COLLOTYPE, from nature.

Views (four) in Brussels, Mons, Oudenarde.

388. COLLOTYPE, from nature.

Views (four) of Antwerp, Dinant, Ostend, and the River Meuse.

389. COLLOTYPE, from nature.

Views (nine) in Antwerp, Bomal, Bruges, Brussels, Ghent, Ostend.

390. COLLOTYPE, from nature.

Postcards (sixteen): Views in Bruges, Echternach, etc.

DENMARK.

SCREEN D.

Axel E. AAMODT.

392. PHOTO-CHROMO-LITHOGRAPH (ten printings)

The Danish Royal Arms.

Vilhelm TRYDE.

393. PHOTOGRAVURE from a painting.

Wedding of Prince Karl of Denmark and Princess Maud of Wales (with a key). By L. Tuxen.

394. PHOTOGRAVURE from a painting.

A Sitting in the Danish Society of Science (with a key). By P. S. Króyer.

395. PHOTOGRAVURE from a painting.

Sommeraften. By V. Kyhn.

396. PHOTOGRAVURE from a painting.

The Sound at Kronborg. By A. Arnesen.

397. COLLOTYPE from statuary.

Christ. By A. Thorvaldsen.

FRANCE.

BAY 17.

MANZI, JOYANT & Cie.

400. PHOTOGRAVURE from a painting.

H.M. the King and the Duke of Connaught at Aldershot, 1895. By E. Détaille.

401. PHOTOGRAVURE from a painting.

Avant le Grain. By Maurice Courant.

402. PHOTOGRAVURE from a painting.

Sortie de la garnison de Huningue. By E. Détaille.

403. PHOTOGRAVURE IN COLOUR from a painting.

François I. By Clouet.

404. PHOTOGRAVURE IN COLOUR from a painting.

"Le livre aux œillets rouges." By Maxence.

405. PHOTOGRAVURE IN COLOUR from a coloured mezzotint.

Madame Pompadour. By J. Watkins Chapman after Boucher.

406. PHOTOGRAVURE IN COLOUR from a crayon drawing.

Portrait of a Lady By G. Boldini.

407. PHOTOGRAVURE from a painting.

An Alfresco Toilette. By Luke Fildes, R.A.

408. PHOTOGRAVURE IN COLOUR from a painting.

La femme au chapeau. By Jean Boldini.

409. HALF-TONE COLOUR PROCESS from paintings.

The cover of "Le Théâtre," June, 1904.
The cover of "Les Modes," June, 1904.

BAY 18.

A ANGLEJAN, Père, Fils & Cie.

410. HELIOGRAVURE. "Tramée" and "Ligne dominante."
Groups of figures in a garden.
Interior with group of figures.

411. HELIOGRAVURE. "Tramée."
Two figures on a rustic bridge.

412. HELIOGRAVURE. "Aquateinte" and Tramée."
Groups of figures in a garden.
Interior with groups of figures.
A Christening Party.

413. HALF-TONE COLOUR PROCESS (three printings) from water-colour paintings, etc.
Twelve specimens

J. CHAUVET.

414. PHOTOGRAVURE from a painting.
Portrait of Leo XIII. By Benjamin Constant.

415. PHOTOGRAVURE from a painting.
Napoléon, 1814. By Meissonier.

416. PHOTOGRAVURE from a painting.
Decorative Panel.

417. PHOTOGRAVURE from a painting.
Napoléon, 1807. By Meissonier.

418. PHOTOGRAVURE (four printings) from an engraving.
Noce de Village. By C. M. Descourtis after Taunay.

419. PHOTOGRAVURE.
Four Plates for coloured impressions.

420. PHOTOGRAVURE.
Impressions in four colours and a complete proof.

A. CHARLO.

421. HELIOCHROME from a painting.

"The Tenor." By A. Guillaume.

422. HELIOCHROME from a painting.

L'entrée au Salon. By A. Guillaume.

423. HELIOCHROME from a painting.

Menu.—Visite du roi d'Italie (Palais de Versailles). By Eugène Morand.

424. HELIOCHROME from a painting.

Christ before Pilate. By J. J. Tissot.

C. RUCKERT & Cie.

425. HALF-TONE COLOUR PROCESS (three printings) from oil paintings, water-colour drawings, and from nature.

Thirteen specimens.

GERMANY.

BAY 19.

The IMPERIAL GERMAN PRINTING PRESS, BERLIN.

430. PROCESS ON ZINC BLOCK from a tinted woodcut.

St. George as a Knight. By Lucas Cranach.

431. PROCESS ON ZINC PLATE from a tinted woodcut.

St. George as a Knight. By Hans Burgkmair.

432. PROCESS ON COPPER PLATE from an engraving.

Landscape. After an old engraving.

433. PROCESS ON COPPER PLATE from an engraving.

Deposition from the Cross. By Toschi.

434. FAC-SIMILE COMBINATION PRINTING. COLLOTYPE AND CHROMO-LITHOGRAPHY.

A German miniature of the 15th century.

435. FAC-SIMILE COMBINATION PRINTING. COLLOTYPE AND CHROMO-LITHOGRAPHY.

Illuminated German manuscript of the 15th century.

436. COLLOTYPE from an engraving.

The Great Elector. By A. Masson.

437. PHOTOGRAVURE from a mezzotint engraving.

Portrait of a Man. By R. Earlom after Van Dyck.

438. COLLOTYPE from an etching.

"The Hundred Guilder Piece." By Rembrandt.

439. PHOTOGRAVURE IN COLOUR from a pastel.

Portrait of Count Algarotti. By Liotard.

440. PHOTOGRAVURE IN COLOUR from a mezzotint engraving.

Portraits of the Duchess of Devonshire, and the Rt. Honourable Georgiana Cavendish. By George Keating. After Sir Joshua Reynolds, P.R.A.

441. PHOTOGRAVURE IN COLOUR from a stipple engraving.

Portraits of Lady Rushout and her Daughter. By Thomas Burke. After Angelica Kauffmann, R.A.

442. PHOTOGRAVURE IN COLOUR from a painting.

Portrait of Hieronymus Holzschuher. By Albrecht Dürer.

443. COLLOTYPE from a drawing.

Portrait of a Man. By G. Laigneau.

444. COLLOTYPE from a drawing.

Study of Female Heads. By A. Watteau.

445. COLLOTYPE from a drawing.

Portrait of William Godwin. By Sir Thomas Lawrence, P.R.A.

446. PHOTO-LITHOGRAPHY from woodcuts.

View of Venice from old woodcuts by Jacopo de' Barbari, in six sections.

BAY 20.

Rud. SCHUSTER.

447. PHOTOGRAVURE from a painting

Forest Glories. By C. L. Fahrbach.

448. PHOTOGRAVURE from a painting.

The Birthday at the Castle. By Arturo Ricci.

449. PHOTOGRAVURE from a painting.

The Enemy in Sight. By R. Friese.

450. PHOTOGRAVURE from a painting.

Forest Monarchs. By C. L. Fahrbach.

Dr. Eugen ALBERT & Co.

451. PHOTOGRAVURE from a painting.

Portrait of H.M. the Emperor William II. By F. von Lenbach.

452. PHOTOGRAVURE from a painting.

Shepherd Boy. By F. von Lenbach.

453. PHOTOGRAVURE IN COLOUR from a painting.

Portrait of Professor Pettenkofer. By F. von Lenbach.

454. PHOTOGRAVURE IN COLOUR from a painting.

Our Lord. By Albrecht Dürer.

455. PHOTOGRAVURE from a painting.

Hermit watering the Horses of a Knight. By Moritz von Schwind.

456. PHOTOGRAVURE from a painting.

Return of the Count of Gleichen from the Crusades. By Moritz von Schwind.

457. HALF-TONE COLOUR PROCESS from paintings.

Landscapes (five).

458. HALF-TONE COLOUR PROCESS from a painting.

Jesus meeting His Mother. By L. Feldmann.

BAY 21.

Franz HANFSTAENGL.

459. PHOTOGRAVURE from a painting.

The Home Wind. By C. Napier Hemy, A.R.A.

460. PHOTOGRAVURE from Life.

Portrait of Henrik Ibsen.

461. PHOTOGRAVURE from a painting.

Willem van Heythuysen. By Frans Hals

462. PHOTOGRAVURE from a painting.

The Sistine Madonna. By Raphael.

463. PHOTOGRAVURE from a painting.

The Happy Warrior. By G. F. Watts, O.M., R.A.

464. PHOTOGRAVURE from a painting.

Portrait of Rembrandt. By himself.

465. AQUARELLE GRAVURE from a painting.

Blind. By B. Piglheim.

466. AQUARELLE GRAVURE from a painting.

In the Play of the Waves. By A. Böcklin

467. AQUARELLE GRAVURE from a painting.

"And a Sword shall pierce thy Soul." By Kaulbach.

468. FAC-SIMILE AQUARELLE from a painting.

Saharet. By F. Von Lenbach.

469. FAC-SIMILE AQUARELLE from a painting.

The Beautiful Duchess. By Thomas Gainsborough, R.A.

470. FAC-SIMILE AQUARELLE from a painting.

Voices from the Sea. By A. Ellis.

471. FAC-SIMILE AQUARELLE from a painting.

The Doge Leonardo Loredano. By Giovanni Bellini.

472. CARBON IMITATION PRINTING: Permanent print on the Collotype principle; from a painting.

The Infant Samuel. By Sir Joshua Reynolds, P.R.A.

473. CARBON IMITATION PRINTING: Permanent print on the Collotype principle; from a painting.

Dignity and Impudence. By Sir Edwin Landseer, R.A

474. CARBON IMITATION PRINTING: Permanent print on the Collotype principle; from a painting.

Madonna and Child. By Raphael.

475. CARBON IMITATION PRINTING: Permanent print on the Collotype principle; from a painting.

Christ and the Doctors. By Luini.

The BERLIN PHOTOGRAPHIC Co.

476. PHOTOGRAVURE from a painting.

Frederick the Great at Sans-Souci. By A. Menzel.

477. PHOTOGRAVURE from a painting.

Her Mother's Voice. By W. Q. Orchardson, R.A.

478. PHOTOGRAVURE from a painting.

The Duchess of Devonshire and Child. By Sir Joshua Reynolds, P.R.A.

479. Fac-simile Gravure in Colour from a painting
Portrait of Queen Louise. By J. Grassi.

480. Fac-simile Gravure in Colour from a painting.
Phœbus and Aurora. By Guido Reni.

BAY 22.

481. Fac-simile Gravure from a painting.
Art wins the Heart. By P. Thumann.

482. Fac-simile Gravure from a painting.
Portrait of Queen Louise. By Gustav Richter.

483. Photogravure from a painting.
The Sistine Madonna. By Raphael.

484. Photogravure from paintings.
The Altar-piece of St. Bavon, Ghent (Adoration of the Lamb). By H. and J. Van Eyck.

HOLLAND.

BAY 22.

H. KLEINMANN & Co.

488. PHOTO-CHROMO-LITHOGRAPHY.
Pictures in a Japanese Temple (two).

489. PHOTO-CHROMO-LITHOGRAPHY.
Stained glass window in the Cathedral of Cologne.

490. PHOTO-CHROMO-LITHOGRAPHY.
Stained glass window in the Cathedral of Cologne.

491. COLLOTYPE IN COLOUR.
Illuminations (four).

Joh. ENSCHEDÉ & Sons.

492. AUTOGRAVURE from an oil painting.
Old woman. By Nicolaas Maes.

493. AUTOGRAVURE from a water-colour painting.
Going home. By Josef Israels.
With six prints in various states.

494. AUTOGRAVURE from a water-colour painting.
The Mill. By Jacob Maris.
With six prints in various states.

494*a*. AUTOGRAVURE from a water-colour painting.
Spring; and the original painting. By Geo. Poggenbeek.
With six prints in various states.

494*b*. AUTOGRAVURE from a water-colour painting.
Dutch Landscape; and the original painting. By F. J. Duchatel.
With six prints in various states.

ITALY.

BAY 22.

FUMAGALLI & C.

495. HELIOTYPE IN COLOUR (four printings) from a painting.
The Crucifixion. By Fra Angelico.

496. HELIOTYPE IN COLOUR (four printings) from a painting.
Adoration of the Magi. By Ghirlandaio.

497. HELIOTYPE IN COLOUR (four printings) from a painting.
La Primavera. By Botticelli.

498. HELIOTYPE IN COLOUR (four printings) from a painting.
Madonna della Sedia. By Raphael.

499. HELIOTYPE IMITATION OF PHOTOGRAVURE from a painting.
The Marriage of the Virgin. By Raphael.

500. HELIOTYPE IMITATION OF PHOTOGRAVURE.
Ecce Homo. By Guido Reni.

501. HELIOTYPE IN COLOUR (four printings) from a painting.
Landscape. By P. Sala.

502. HELIOTYPE IN COLOUR (four printings) from a water-colour painting.
Landscape. By P. Sala.

BAY 23.

ISTITUTO ITALIANO D'ARTI GRAFICHE.

503. HALF-TONE COLOUR PROCESS (three printings) from nature.

Cappella Colleoni, Bergamo.

504. HALF-TONE COLOUR PROCESS (three printings) from nature.

Italian Butterflies.

505. HALF-TONE COLOUR PROCESS (three printings) from a painting.

Marriage of St. Catherine. By Lorenzo Lotto.

506. HALF-TONE COLOUR PROCESS (three printings).

Views in Bergamo (five).

507. FAC-SIMILE PROCESS from a woodcut.

St. Jerome. By Albrecht Dürer.

508. FAC-SIMILE PROCESS from a woodcut.

St. Humbert. By Albrecht Dürer.

509. FAC-SIMILE PROCESS from an engraving.

St. Elizabeth. By Paul Delaroche.

510. FAC-SIMILE PROCESS from an engraving.

Raising of Lazarus. By Benedetto da Castiglione.

511. PHOTOGRAVURE from a painting.

The Dead Christ. By Andrea Mantegna.

512. PHOTOGRAVURE from a painting.

Madonna and Child. By G. Szoldatics.

513. PHOTOGRAVURE from a painting.

Madonna della Candeletta. By C. Crivelli.

514. PHOTOGRAVURE.

A Triptych. By C. Crivelli.

515. PHOTOGRAVURE from a painting.
A Pièta. By Giovanni Bellini.

516. PHOTO-ENGRAVING from paintings.
St. Sebastian. By Raphael.
Two Holy Women. By Lucas Cranach.

517. PHOTO-ENGRAVING from paintings.
Madonna and Child. By Giovanni Bellini.
The Road to Calvary. By Albrecht Dürer.

Paolo LODI.

518. PHOTO-ENGRAVING from engravings.
Specimens of book illustrations (five) and a copy of American Certificates.

Arturo ALINARI.

519. COLLOTYPE IN COLOUR (three printings) from a painting.
The Three Graces from La Primavera. By Botticelli.

520. COLLOTYPE IN COLOUR (three printings) from a painting.
The Adoration. By Fra Filippo Lippi.

521. COLLOTYPE IN COLOUR (three printings) from a painting.
The Repose in Egypt. By Sir Anthony Van Dyck.

522. COLLOTYPE IN COLOUR (three printings) from a painting.
La Bella. By Titian.

RUSSIA.

BAY 24.

The GOLICKE & WILBORG Co.

526. COLLOTYPE from life and from a painting.
Portrait of a Woman.
Classic Scene.

527. COLLOTYPE from life.
Portrait of a Man.

528. COLLOTYPE from nature.
A Forest Scene in Winter.

529. PHOTOGRAVURE from a painting.
Noël: la bonne aventure. By H. K. Pimonenko

530. PHOTOGRAVURE from a painting and from life.
Wounded.
Portrait of Baron P. K. Meyendorff.

531. PHOTOGRAVURE from a painting.
La Forêt.

532. PHOTOGRAVURE IN COLOUR from paintings.
A portrait of a Man.
Woman and Child.

533. HALF-TONE COLOUR PROCESS.
A Political Mission.

534. HALF-TONE COLOUR PROCESS.
Illustrations (two) for books.

535 HALF-TONE COLOUR PROCESS.
Portrait of Princess Prascovie Galitzine.

536. HALF-TONE COLOUR PROCESS from water-colour drawings.

Portraits of a Man and a Woman.

Sleigh Races on the Neva. By A. Orlovsky.

537. HALF-TONE COLOUR PROCESS from paintings.

Illustrations (two) for books.

538. HALF-TONE COLOUR PROCESS from drawings.

Illustrations (two) for books.

539. HALF-TONE COLOUR PROCESS from a drawing.

A portrait of a Man.

M. PAVLOV.

540. COLLOTYPE from nature.

Moscow: View of the Kremlin, taken from the Bridge over the Moskwa.

541. COLLOTYPE from nature.

Moscow: View of the Kremlin, taken from the Stone Bridge.

542. COLLOTYPE from nature.

Alley in Winter, near Moscow.

543. COLLOTYPE from nature.

Moscow: View of the Kremlin wall taken from the Quay of the Moskwa.

544. COLLOTYPE IN COLOUR.

Icons (two). The Virgin and Child

545. COLLOTYPE IN COLOUR.

Textile fabrics.

546. COLLOTYPE IN COLOUR.

Manuscript by Niphant, a saint in the Russian Calendar.

Archæological Fragments

SPAIN.

BAY 24.

The Proprietors of the "FORMA."

550. HALF-TONE COLOUR PROCESS from drawings.

Angels. By Goya.
An old Garden. By S. Rusiñol.
Dancing Girl. By X. Gosé.

551. HALF-TONE COLOUR PROCESS from drawings.

Study of a Young Woman. By R. Casas.
Study of a Young Woman. By R. Casas.
Majorca. By Mir.
Mountains. By Pidelasserra.

552. HALF-TONE COLOUR PROCESS from drawings.

Grenada. By S. Rusiñol.
The Furnace. By L. Graner.
Le Moulin de la Galette. By R. Casas.

553. PHOTOTYPE from a drawing.

The Kiss. After M. Feliu.
Printed by J. Thomas.

LAPORTA Brothers.

554. HALF-TONE COLOUR PROCESS (three printings) from an oil painting.

Spanish Cavalry Soldier. By E. Banda.
With the original painting.

555. HALF-TONE COLOUR PROCESS (three printings) from an oil painting.

Fragment of a subject. By Domingo Muñoz.
Isolated proofs of each colour.

556. HALF-TONE COLOUR PROCESS (three printings) from an oil painting.

Cavalry Sergeant. By E. Esteban.

SWEDEN.

BAY 25.

Justus CEDERQUIST.

557. HALF-TONE COLOUR PROCESS from oil and water-colour paintings.

A Spanish Girl. By E. Lundgren.
"Murre." By Carl Larsson.
"Easter." By E. Küsel.
Esther and Ahasuerus. By O. Hjortzberg.

558. HALF-TONE COLOUR PROCESS from a water-colour painting

"On the Crust." By G. Hallström.

559. HALF-TONE COLOUR PROCESS from oil paintings.

Spring. By Prince Eugen, of Sweden.
The Bright Night. By Prince Eugen, of Sweden

560. HALF-TONE COLOUR PROCESS from oil paintings.

On the way to Church. By E. Wilhelmsohn.
In a Fish-shop. By O. Björck.

SWITZERLAND.

BAY 25.

POLYGRAPHISCHES INSTITUT.

565. PHOTOCROM from paintings.
Sixteen subjects.

566. PHOTOCROM from paintings.
Portrait of President McKinley with original.
Portrait of G. Hauser with original.
Portrait of a Lady.

567. PHOTOCROM from a painting.
Early Spring. By Paul Robert.

568. PHOTOCROM from a painting.
Deer.

569. PHOTOCROM from a painting.
Deer.

570. PHOTOCROM from nature.
Flowers.

571. COLLOTYPE.
Twelve examples.

CASE No. 8.

572. COLLOTYPE AND HALF-TONE COLOUR PROCESSES.
Books and Albums containing illustrations.

BAY 26.

BUCHDRUCKEREI BERICHTHAUS.

573. HALF-TONE COLOUR PROCESS from objects.
Book illustrations (two).

574. HALF-TONE COLOUR PROCESS from a painting.
Book illustration.

575. HALF-TONE COLOUR PROCESS from drawings.
Book illustrations (four).

576. HALF-TONE COLOUR PROCESS from paintings.
Book illustrations (four).

577. HALF-TONE COLOUR PROCESS from paintings.
Book illustrations (four).

578. HALF-TONE COLOUR PROCESS.
Book illustration.

UNITED STATES OF AMERICA.

BAY 26.

F. E. IVES (The Ives Process Co.)

582. HALF-TONE COLOUR PROCESS.
Seven specimens.

583. HALF-TONE COLOUR PROCESS.
Nine specimens.

584. HALF-TONE COLOUR PROCESS.
Four specimens.

585. HALF-TONE COLOUR PROCESS.
Eight specimens.

The CONTINENTAL COLORTYPE Co.

586. HALF-TONE COLOUR PROCESS.
Illustrations (four) for books. Rugs.

587. HALF-TONE COLOUR PROCESS.
Illustrations (four) for books. Rugs.

588. HALF-TONE COLOUR PROCESS.
Illustrations (three) for books.

589. HALF-TONE COLOUR PROCESS.
Illustrations (four) for books. Fish.

590. HALF-TONE COLOUR PROCESS.
Illustrations (four) for books. Fish.

591. HALF-TONE COLOUR PROCESS.
Illustrations (two) for books.

BROWN & BIGELOW.

592. HALF-TONE COLOUR PROCESS from paintings.
Four specimens.

593. HALF-TONE COLOUR PROCESS from paintings.
Three specimens.

GATCHEL & MANNING.

594. HALF-TONE COLOUR PROCESS.
Three specimens.

595. HALF-TONE COLOUR PROCESS.
Four specimens.

596. HALF-TONE COLOUR PROCESS.
Four specimens.

A. W. ELSON & Co.

597. PHOTOGRAVURE from a painting.
Portrait of General Washington. By Gilbert Stuart.

598. PHOTOGRAVURE from a painting.
Departure from a Masked Ball. By Raimundo Madrazo.

599. PHOTOGRAVURE from a painting.
Dignity and Impudence. By Sir Edwin Landseer R.A.

600. PHOTOGRAVURE IN COLOUR (one printing), from a painting.
Portrait of Benjamin Franklin. By J. S. Duplessis.

JAPAN

SCREEN E.

The KOKKA COMPANY.

603. COLLOTYPE.
Two specimens.

604. COLLOTYPE.
Two specimens

605. COLLOTYPE.
Two specimens

606. COLLOTYPE.
Two specimens.

607. COLLOTYPE.
Four specimens.

Property of the Museum.

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